

The
YOUNG FOLKS
TREASURY







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GAUDY TROPICAL BIRDS

1. Ara; Macaw.

2. Rose-Crested Cockatoo.

3. Senegal Parrot,

4. Mexican Toucan.

5. African Hornbill.

THE ANIMAL WORLD

HAMILTON WRIGHT MABIE
EDWARD EVERETT HALE
WILLIAM BYRON FORBUSH
Editors

JENNIE ELLIS BURDICK
Assistant Editor

Volume



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INTRODUCTION

THE first part of this volume consists of Theodore Wood's popular work, *THE ANIMAL WORLD*, revised by the well-known American naturalist, Ernest Ingersoll. It consists of an interesting, orderly, and attractive account of the animal life of the whole world, brightened by incidents and made intelligible by simple explanations of obscure facts.

Next comes "*THE ANIMAL WORLD: FOR LITTLE FOLKS*," story-sketches of the babyhood of some of the familiar beasts of the home and the Zoo.

The remainder of the volume is devoted to articles intended to encourage the habit of observation and the joy of making original discoveries in the outdoor world. Birds are no doubt the most interesting of God's creatures and as they are not discussed at length in the first section, considerable pains is taken to give suggestions on "*HOW TO KNOW THE BIRDS*."

This volume is particularly rich in illustrations, containing more color plates than any other single volume of the series.

WILLIAM BYRON FORBUSH



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By THEODORE WOOD

Revised and Edited by Ernest Ingersoll

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THE ANIMAL WORLD

By THEODORE WOOD

REVISED AND EDITED BY ERNEST INGERSOLL

MAMMALS

CHAPTER I

APES AND GIBBONS

FIRST among the mammals come the monkeys. First among the monkeys come the apes. And first among the apes come the chimpanzees, almost the largest of all monkeys.

CHIMPANZEES

When it is fully grown a male chimpanzee stands nearly five feet high. And it would be even taller still if only it could stand upright.

But that is a thing which no monkey can ever do, because instead of having feet as we have, which can be planted flat upon the ground, these animals only have *hind hands*. There is no real sole to them, no instep, and no heel; while the great toe is ever so much more like a huge thumb. The consequence is that when a monkey tries to stand upright he can only rest upon the outside edges of these hand-like feet, while his knees have to be bent awkwardly outward. So he looks at least three inches shorter than he really is, and he can only hobble along in a very clumsy and ungraceful manner.

But then, on the other hand, he is far better able to climb about in the trees than we are, because while we are only able to place our feet flat upon a branch, so as to stand upon it, he can grasp the branches with all four hands, and obtain a very much firmer hold.

Chimpanzees are found in the great forests of Central and Western Africa, where they feed upon the wild fruits which grow there so abundantly. They spend almost the whole of their lives among the trees, and have a curious way of making nests for their families to live in, by twisting the smaller branches of the trees together, so as to form a small platform. The mother and her little ones occupy this nest, while the father generally sleeps on a bough just underneath it. Sometime quite a number of these nests may be seen close together, the chimpanzees having built a kind of village for themselves in the midst of the forest.

A CLEVER SPECIMEN

If you visit the zoölogical gardens in New York, London, or some other city, you may be quite sure of seeing one or more chimpanzees. They are nearly always brought to the zoos when they are quite young, and the keepers teach them to perform all kinds of clever tricks. One of them in the London Zoo, who was called "Sally," and who lived there for several years, actually learned to count! If she was asked for two, three, four, or five straws, she would pick up just the right number from the bottom of her cage and hand them to the keeper, without ever making a mistake. Generally, too, she would pick up six or seven straws if the keeper asked for them. But if eight, nine, or ten were asked for she often became confused, and could not be quite sure how many to give. She was a very cunning animal, however, and when she became tired of counting she would sometimes pick up two straws only and double them over, so as to make them look like four!

"Sally" could talk, too, after a fashion, and used to make three different sounds. One of these evidently meant "Yes," another signified "No," and the third seemed to be intended for "Thank you," as she always used it when the keeper gave her a nut or a banana.

Two kinds of chimpanzees are known, namely the common chimpanzee, which is by far the more plentiful of the two, and

the bald chimpanzee, which has scarcely any hair on the upper part of its head. One very intelligent bald chimpanzee was kept in Barnum's menagerie, and was even more clever, in some ways, than "Sally" herself.

THE GORILLA

Larger even than the chimpanzee is the gorilla, the biggest and strongest of all the apes, which sometimes grows to a height of nearly six feet. It is only found in Western Africa, close to the equator, and has hardly ever been seen by white travelers, since it lives in the densest and darkest parts of the great forests. But several gorillas—nearly all quite small ones—have been caught alive and kept in captivity in zoos, where, however, they soon died.

One of these, named "Gena," lived for about three weeks in the Crystal Palace, near London. She was a most timid little creature, and if anybody went to look at her she would hide behind a chimpanzee, which inhabited the same cage, and watched over her in the most motherly way. Another, who was called "Pongo," lived for rather more than two months in the London Zoo, and seemed more nervous still, for he used to become terrified if even his keeper went into the cage. But when the animal has grown up it is said to be a most savage and formidable foe, and the natives of Central Africa are even more afraid of it than they are of the lion.

Like most of the great apes, the gorilla has a most curious way of sheltering itself during a heavy shower of rain. If you were to look at its arms, you would notice that the hair upon them is very thick and long, and that while it grows *downward* from the shoulder to the elbow, from the elbow to the wrist it grows *upward*. So when it is caught in heavy rain, the animal covers its head and shoulders with its arms. Then the long hair upon them acts just like thatch and carries off the water, so that the gorilla hardly gets wet at all.

When the gorilla is upon the ground it generally walks upon all fours, bending the fingers of the hands inward, so that it rests upon the knuckles. * But it is much more active in the trees,

and is said to be able to leap to the ground from a branch twenty or thirty feet high, without being hurt in the least by the fall.

THE ORANG-UTAN

Another very famous ape is the orang-utan, which is found in Borneo and Sumatra. It is reddish brown in color, and is clothed with much longer hair than either the gorilla or the chimpanzee, while its face is surprisingly large and broad, with a very high forehead. But the most curious feature of this animal is the great length of its arms. When a man stands upright, and allows his arms to hang down by his sides, the tips of his fingers reach about half-way between his hips and his knees. When a chimpanzee stands as upright as possible, the tips of its fingers almost touch its knees. But when an orang-utan does the same its fingers nearly touch the ground. Of course, when the animal is walking, it finds that these long arms are very much in its way. So it generally uses them as crutches, resting the knuckles upon the ground, and swinging its body between them.

But the orang seldom comes down to the ground, for it is far more at its ease among the branches of the trees. And although it never seems to be in a hurry, it will swing itself along from bough to bough, and from tree to tree, quite as fast as a man can run below. Like the gorilla and the chimpanzee, it makes rough nests of twisted boughs, in which the female animal and the little ones sleep. And if it is mortally wounded, it nearly always makes a platform of branches in the same way, and sits upon it waiting for death.

Orangs are often to be seen in zoölogical gardens, although they are so delicate that they do not thrive well in captivity. One of these animals, which lived in the London Zoo for some time, had learned a very clever trick. Leaning up against his cage was a placard, on which were the words "The animals in this cage must not be fed." The orang very soon found out that when this notice was up nobody gave him any nuts or biscuits. So he would wait until the keeper's back was

turned, knock the placard down with the printed words underneath, and then hold out his paw for food!

As a general rule, oranges seem far too lazy to be at all savage. Those in zoos nearly always lie about on the floor of their cage all day, wrapped in their blankets, with a kind of good-humored grin upon their great broad faces. But when they are roused into passion they seem to be very formidable creatures, and Alfred Russel Wallace tells us of an orang that turned upon a Dyak who was trying to spear it, tore his arm so terribly with his teeth that he never recovered the proper use of the limb, and would almost certainly have killed him if some of his companions had not come to his rescue.

GIBBONS

Next we come to the gibbons, which are very wonderful animals, for they are such astonishing gymnasts. Most monkeys are very active in the trees, but the gibbons almost seem to be flying from bough to bough, dashing about with such marvelous speed that the eye can scarcely follow their movements. Travelers, on seeing them for the first time, have often mistaken them for big blackbirds. They hardly seem to swing themselves from one branch to another. They just dart and dash about, upward, downward, sideways, backward, often taking leaps of twenty or thirty feet through the air. And yet, so far as one can see, they only just touch the boughs as they pass with the tips of their fingers.

If you should happen to see a gibbon in the next zoo that you visit, be sure to ask the keeper to offer the animal a grape, or a piece of banana, and you will be more than surprised at its marvelous activity.

The arms of the gibbons are very long—although not quite so long as those of the orang-utan—so that when these animals stand as upright as they can the tips of their fingers nearly touch the ground. But they do not use these limbs as crutches, as the orang does. Instead of that, they either clasp their hands behind the neck while they are walking, or else stretch out the arms on either side with the elbows bent downward, to

help them in keeping their balance. So that when a gibbon leaves the trees and takes a short stroll upon the ground below, it looks rather like a big letter W suspended on a forked pole!

Gibbons generally live together in large companies, which often consist of from fifty to a hundred animals, and they have a very odd habit of sitting in the topmost branches of tall trees at sunrise, and again at sunset, and joining in a kind of concert. The leader always seems to be the animal with the strongest voice, and after he has uttered a peculiar barking cry perhaps half a dozen times, the others all begin to bark in chorus. Often for two hours the outcry is kept up, so loud that it may be heard on a still day two or three miles. Then by degrees it dies away, and the animals are almost silent until the time for their next performance comes round.

Several different kinds of gibbons are known, the largest of which is the siamang. This animal is found only in Sumatra. It is a little over three feet high when fully grown. If you ever see it at a zoo you may know it at once by its glassy black color, and its odd whitish beard. Then there is the hoolock, which is common in many parts of India, and has a white band across its eyebrows, while the lar gibbon, of the Malay Peninsula, has a broad ring of white all round its face. Besides these there are one or two others, but they are all so much alike in their habits that there is no need to mention them separately.



TYPES OF APES AND MONKEYS

- | | | |
|---------------------|---------------------|--------------------|
| 1. Diana Monkey. | 2. Orang-utan. | 3. Hanuman Monkey. |
| 4. Mandrill Baboon. | 5. Capuchin Monkey. | 6. Spider Monkey. |

CHAPTER II

BABOONS

HOW can we tell a baboon from an ape?

That is quite easy. Just glance at his face. You will notice at once that he has a long, broad muzzle, like that of a dog, with the nostrils at the very tip. For this reason the baboons are sometimes known as dog-faced monkeys. Then look at his limbs. You will see directly that his arms are no longer than his legs. That is because he does not live in the trees, as the apes do. He lives in rough, rocky places on the sides of mountains, where there are no trees at all, so that arms like those of the gibbons or the orang-utan would be of no use to him. He does not want to climb. He wants to be able to scamper over the rocks, and to run swiftly up steep cliffs where there is only just room enough to gain a footing. So his limbs are made in such a way that he can go on all fours like a dog, and gallop along so fast among the stones and boulders that it is hard to overtake him.

THE CHACMA

Perhaps the best known of the baboons is the chacma, which is found in South Africa. The animal is so big and strong, and so very savage, that if he is put into a large cage in company with other monkeys, he always has to be secured in a corner by a stout chain. A chacma that lived for some years in the Crystal Palace was fastened up in this way, and the smaller monkeys, who knew exactly how far his chain would allow him to go, would sit about two inches out of his reach and eat their nuts in front of him. This used to make the chacma furious, and after chattering and scolding away for some time, as if telling his tormentors what dreadful things he would do to them

if ever he got the chance, he would snatch up an armful of straw from the bottom of his cage and fling it at them with both hands.

"If I fed the smaller monkeys with nuts, instead of giving them to him," says a visitor, "he would fling the straw at me."

Chacmas live in large bands among the South African mountains, and are very difficult to watch, as they always post two or three of their number as sentinels. As soon as any sign of danger appears one of the watchers gives a short, sharp bark. All the rest of the band understand the signal, and scamper away as fast as they can.

Sometimes, however, the animals will hold their ground. A hunter was once riding over a mountain ridge when he came upon a band of chacmas sitting upon a rock. Thinking that they would at once run away, he rode at them, but they did not move, and when he came a little closer they looked so threatening that he thought it wiser to turn back again.

An angry chacma is a very formidable foe, for it is nearly as big as a mastiff, and ever so much stronger, while its great tusk-like teeth cut like razors. When one of these animals is hunted with dogs it will often gallop along until one of its pursuers has outstripped the rest, and will then suddenly turn and spring upon him, plunge its teeth into his neck, and, while its jaws are still clenched, thrust the body of its victim away. The result is that the throat of the poor dog is torn completely open, and a moment later its body is lying bleeding on the ground, while the chacma is galloping on as before.

These baboons are very mischievous creatures, for they come down from their mountain retreats by night in order to plunder the orchards. And so cautiously is the theft carried out, that even the dogs on guard know nothing of what is going on, and the animals nearly always succeed in getting away.

When it cannot obtain fruit, the chacma feeds chiefly upon the bulb of a kind of iris, which it digs out of the ground with its paw, and then carefully peels. But it is also fond of insects, and may often be seen turning over stones, and catching the beetles which were lying hidden beneath them. It will even eat scorpions, but is careful to pull off their stings before doing so.

THE MANDRILL

Another interesting baboon is the mandrill, which one does not often see in captivity. It comes from Western Africa. While it is young there is little that is remarkable about it. But the full-grown male is a strange-looking animal, for on each of its cheeks there is a swelling as big as a large sausage, which runs upward from just above the nostrils to just below the eyes. These swellings are light blue, and have a number of grooves running down them, which are colored a rich purple, while the line between them, as well as the tip of the nose, is bright scarlet. The face is very large in proportion to the size of the body, and the forehead is topped by a pointed crest of upright black hair, while under the chin is a beard of orange yellow. On the hind quarters are two large bare patches of the same brilliant scarlet as the nose. So you see that altogether a grown-up male mandrill is a very odd-looking creature.

The female mandrill has much smaller swellings on her face. They are dull blue in color, without any lines of either purple or scarlet.

Almost all monkeys are subject at times to terrible fits of passion, but the mandrill seems to be the worst tempered of all. Fancy an animal dying simply from rage! It sounds impossible, yet the mandrill has been known to do so. And the natives of the countries in which it lives are quite as much afraid of it as they are of a lion.

Yet it has once or twice been tamed. In the Natural History Museum, at South Kensington, London, is the skin of a mandrill which lived for some years in that city in the earlier part of the nineteenth century. His name was "Jerry," and he was so quiet and contented that he was generally known as "Happy Jerry." He learned to smoke a pipe. He was very fond of a glass of beer. He even used to sit at table for his meals, and to eat from a plate by means of a knife and fork. And he became so famous that he was actually taken down to Windsor to appear before King George the Fourth!

There is another baboon called the drill, which is not unlike

the mandrill in many respects, but the swellings on its face are not nearly as large, and they remain black all through its life. It is a much smaller animal, too, and looks, on the whole, very much like a mandrill while it is quite young.

THE GELADA

Almost as odd-looking as the mandrill, though in quite a different way, is the gelada, which is found in Abyssinia. Perhaps we may compare it to a black poodle with a very long and thick mane upon its neck and shoulders. When the animal sits upright this mane entirely covers the upper part of its shoulders, so that a gelada looks very much as if it were wearing a coachman's mantle of long fur.

In some parts of Abyssinia geladas are very numerous, living among the mountains in bands of two or three hundred. Like the chacmas in South Africa, they are very mischievous in the orchards and plantations, always making their raids by night. It is said that on one occasion they actually stopped no less a personage than a Duke of Saxe-Coburg-Gotha, and prevented him from proceeding on his journey for several hours.

The story is, that as the Duke was traveling in Abyssinia his road lay through a narrow pass, overhung with rocky cliffs; that one of his attendants, catching sight of a number of geladas upon the rocks above, fired at them; that the angry baboons at once began to roll down great stones upon the path below, and that before they could be driven off they succeeded in completely blocking the road, so that the Duke's carriage could not be moved until the stones had been cleared away.

Whether this story is altogether true or not, we cannot say. But there can be no doubt that geladas are very warlike animals. Not only will they attack human beings who interfere with them, they also attack other baboons. When they are raiding an orchard, for instance, they sometimes meet with a band of Arabian baboons, which have come there for the same purpose as themselves. A fierce battle then takes place. First of all the geladas try to roll down stones upon their rivals. Then they rush down and attack them with the utmost fury, and very

soon the orchard is filled with maddened baboons, tumbling and rolling over one another, biting and tearing and scratching each other, and shrieking with furious rage.

The Arabian baboon itself is a very interesting creature, for it is one of the animals which were venerated by the ancient Egyptians. They considered it as sacred to their god Thoth, and treated it with the greatest possible honor; and when it died they made its body into a mummy, and buried it in the tombs of the kings. Sometimes, too, they made use of the animal while it lived, for they would train it to climb a fig-tree, pluck the ripe figs, and hand them down to the slaves waiting below.

These baboons sometimes travel in great companies. The old males always go first, and are closely followed by the females, those which have little ones carrying them upon their backs. As they march along, perhaps one of the younger animals finds a bush with fruit upon it, and stops to eat a little. As soon as they see what he is doing, a number of others rush to the spot, and begin fighting for a share. But generally one of the old males hears the noise, boxes all their ears and drives them away, and then sits down and eats the fruit himself.

THE PROBOSCIS-MONKEY

Next we come to a group of animals called dog-shaped monkeys, and the most curious of them all is the proboscis-monkey. This is the only monkey which really possesses a nose. Some monkeys have nostrils only, and some have muzzles, but the proboscis-monkey has not merely a nose, but a very long nose, so long, in fact, that when one of these monkeys is leaping about in the trees it is said always to keep its nose carefully covered with one hand, so that it may not be injured by a knock against a bough.

Strange to say, it is only the male animal that has this very long nose, and even he does not get it until he is grown up. Indeed, you can tell pretty well how old a male proboscis-monkey is just by glancing at his nose. When he is young it is quite small. As he gets older it grows bigger. And by the

time that he reaches his full size it is three or four inches long. Naturally this long nose gives him a very strange appearance, and his great bushy whiskers, which meet under his chin, make him look more curious still.

We do not know much about the habits of the proboscis-monkey. In Borneo, its native country, it lives in the thick forests, and is said to be almost as active among the branches of the trees as the gibbons themselves. The Dyaks do not believe that it is a monkey at all, but say that it is really a very hairy man, who insists on living in the forests in order to escape paying taxes.

THE HANUMAN

The hanuman, another of the dog-shaped monkeys, lives in India, where it is treated with almost as much reverence as the Arabian baboon was in Egypt in days of old.

The natives do not exactly worship these monkeys, but they think that they are sacred to the god Hanuman, from whom they take their name. Besides that, they believe that these animals are not really monkeys at all, but that their bodies are inhabited by the souls of great and holy men, who lived and died long ago, but have now come back to earth again in a different form. So no Hindu will ever kill a hanuman monkey or injure it in any way, no matter how much mischief it may do. The consequence is that these animals are terrible thieves. They know perfectly well that no one will try to kill them, or even to trap them, so they come into the villages, visit the bazaars, and help themselves to anything to which they may take a fancy. Yet all that the fruit-sellers will do is to place thorn-bushes on the roofs of their shops to prevent the monkeys from sitting there.

European sportsmen, however, often find the hanuman very useful. For its greatest enemy is the tiger, and when one of these animals is being hunted a number of hanumans will follow it wherever it goes, and point it out to the beaters by their excited chattering.

Next to the tiger, the hanuman dislikes snakes more than any living creature, and when it finds one of these reptiles asleep

it will creep cautiously up to it, seize it by the neck, and then rub its head backward and forward upon a branch till its jaws have been completely ground away.

The hanuman belongs to a group of monkeys which are called langurs. They may be known by their long and almost lanky bodies, by the great length of their tails, and by the fact that they do not possess the cheek-pouches which many other monkeys find so useful. And it is very curious that while the arms of the apes are longer than their legs, the legs of the langurs—which are almost as active in the trees—are longer than their arms.

If you ever happen to see a hanuman you may know it at once by its black face and feet, and by its odd eyebrows, which are very bushy, and project quite away in front of its face.

THE GUENONS

We now come to the guenons, of which there are a great many kinds. Let us take two of these as examples of the rest. The first is the green monkey, which comes from the great forests of Western Africa. You may know it by sight, because it is the commonest monkey in every menagerie. It is one of the monkeys, too, which organ-grinders so often carry about on their organs. But they do not care to have it except when it is quite young, for although it is very gentle and playful until it reaches its full size, it afterward becomes fierce and sullen, and is apt at any moment to break out into furious passion.

Like most of the guenons, green monkeys go about in droves, each under the leadership of an old male, who wins and keeps his position by fighting all his rivals. Strange to say, each of these droves seems to have its own district allotted to it; and if by any chance it should cross its boundary, the band into whose territory it has trespassed will at once come and fight it, and do their utmost to drive it back.

Wouldn't it be interesting to know how the animals mark out their own domains, and how they let one another know just how far they will be permitted to go?

Our second example of the guenons is the diana monkey,

which you may at once recognize by its long, pointed, snow-white beard. It seems to be very proud of this beard, and while drinking holds it carefully back with one hand, in order to prevent it from getting wet.

Why is it called the "diana" monkey? Because of the curious white mark upon its forehead, which is shaped like the crescent which the ancients used to think was borne by the goddess Diana. It is a very handsome animal, for its back is rich chestnut brown in color, and the lower part of its body is orange yellow, while between the two is a band of pure white. Its face and tail and hands and feet are black. It is a very gentle animal, and is easily tamed.

THE MANGABEYS

These are very odd-looking monkeys, for they all have white eyelids, which are very conspicuous in their sooty-black faces. Indeed, they always give one a kind of idea that they must spend their whole lives in sweeping chimneys.

They are among the most interesting of all monkeys to watch, for they are not only so active and full of life that they scarcely seem able to keep still, but they are always twisting their bodies about into all sorts of strange attitudes. When in captivity they soon find out that visitors are amused by their antics, and are always ready to go through their performances in order to obtain a nut or a piece of cake.

Then they have an odd way, when they are walking about their cages, of lifting their upper lips and showing their teeth, so that they look just as if they were grinning at you. And instead of carrying their tails behind them, as monkeys generally do, or holding them straight up in the air, they throw them forward over the back, so that the tip comes just above the head.

Only four kinds of mangabey are known, and they are all found in Western Africa.

MACAQUES

There is one more family of monkeys found in the Old World which we must mention, and that consists of the animals

known as macaques. They are natives of Asia, with one exception, and that is the famous magot, the only monkey which lives wild in any part of Europe. It inhabits the Rock of Gibraltar, and though it is not nearly as common as it used to be, there is still a small band of these animals with which nobody is allowed to interfere. They move about the Rock a good deal. When the weather is warm and sunny, they prefer the side that faces the Mediterranean, but as soon as a cold easterly wind springs up they all travel round to the western side, which is much more sheltered. They always keep to the steepest parts of the cliff, and it is not easy to get near enough to watch them. Generally the only way to see them at all is by means of a telescope.

The magot is sometimes known as the Barbary ape, although of course it is not really an ape at all. But it is very common in Barbary, and two or three times, when the little band of monkeys on the Rock seemed in danger of dying out, a few specimens have been brought over from Africa just to make up the number.

The only other member of this family that we can mention is the crab-eating macaque, which is found in Siam and Burma. It owes its name to its fondness for crabs, spending most of its time on the banks of salt-water creeks in order to search for them. But perhaps the strangest thing about it is that it is a splendid swimmer, and an equally good diver, for it has been known to jump overboard and to swim more than fifty yards under water, in its attempts to avoid recapture.

CHAPTER III

THE AMERICAN MONKEYS AND THE LEMURS

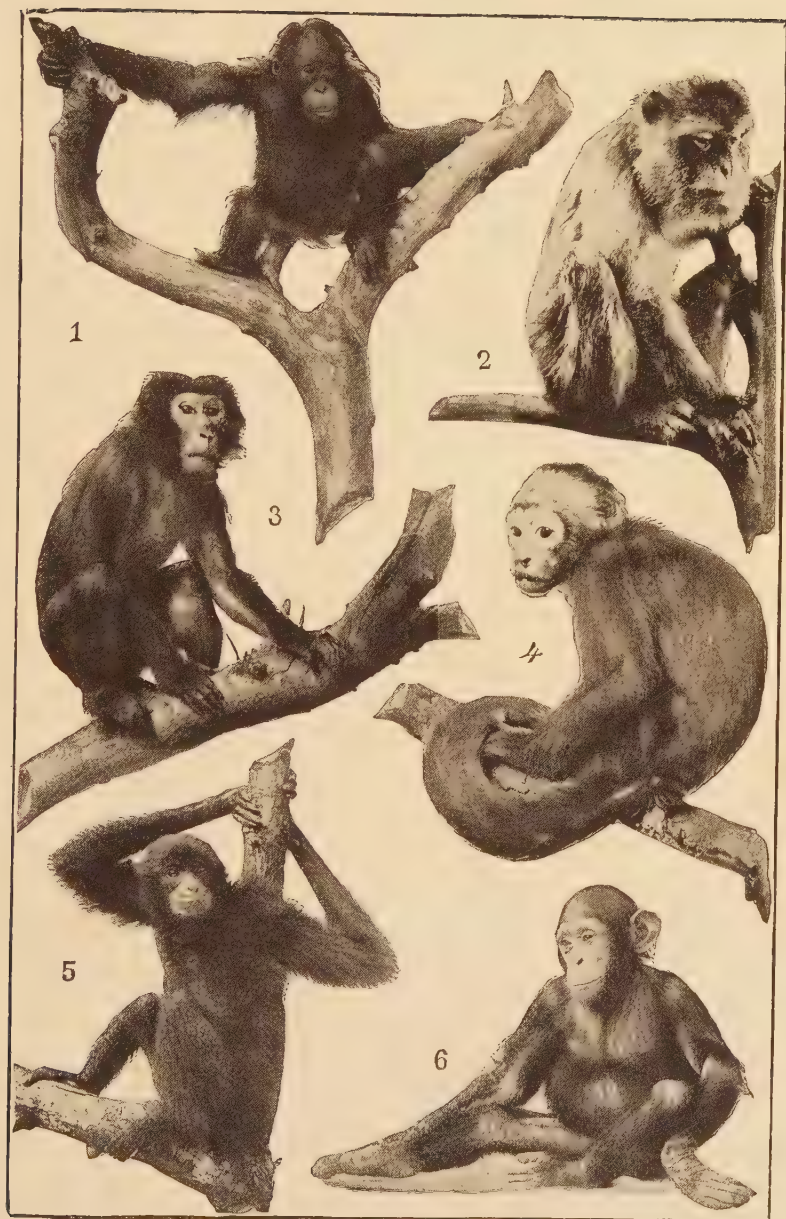
A GREAT many very curious monkeys live in America; and in several ways they are very different from those of Africa and Asia.

Most of the Old World monkeys, for example, possess large cheek-pouches, in which, after eating a meal, they can carry away nearly enough food for another. No doubt you have often seen a monkey with its cheeks perfectly stuffed out with nuts. But in the American monkeys these pouches are never found.

Then no American monkey has those bare patches on its hind quarters, which are present in all the monkeys of the Old World, with the exception of the great apes, and which are often so brightly colored. And, more curious still, no American monkey has a proper thumb. The fingers are generally very long and strong; but the thumb is either wanting altogether, or else it is so small that it cannot be of the slightest use.

SPIDER-MONKEYS

Perhaps the most curious of all the American monkeys are the spider-monkeys, which look very much like big black spiders when one sees them gamboling among the branches of the trees. The reason is that their bodies are very slightly built, and their arms and legs are very long and slender, while the tail is often longer than the head and body together, and looks just like an extra limb. And indeed it is used as an extra limb, for it is prehensile; that is, it can be coiled round any small object so tightly as to obtain a very firm hold. A spider-monkey never likes to take a single step without first twisting the tip of its tail round a branch, so that this member really serves as a sort of fifth hand. Sometimes, too, the animal will feed itself with its tail instead of with its paws. And it can even



PHOTOGRAPHIC PORTRAITS OF MONKEYS.

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| 1. Young Orang utan "Dohong." | 2. Barbary Ape. |
| 3. Japanese Red-faced Monkey. | 4. White-faced Sapsajou. |
| 5. Siamang Gibbon. | 6. Chimpanzee "Polly." |

All lived in the New York Zoölogical Park.



hang from a bough for some little time by means of its tail alone, in order to pluck fruit which would otherwise be out of its reach.

Owing partly, no doubt, to constant use, the last few inches of this wonderful tail are quite bare underneath—without any hair at all. It is worth while to remember, just here, that while in many American monkeys the tail has this prehensile grasp, no monkey of the Old World is provided with this convenience.

When a spider-monkey finds itself upon level ground, where its tail, of course, is of no use to it, it always seems very uncomfortable. But it manages to keep its balance as it walks along by holding the tail over its back, and just turning it first to one side and then to the other, as the need of the moment may require. It uses it, in fact, very much as an acrobat uses his pole when walking upon the tight rope.

It is rather curious to find that while other monkeys are very fond of nibbling the tips of their own tails, often making them quite raw, spider-monkeys never do so. They evidently know too well how useful those members are to injure them by giving way to such a silly habit—which is even worse than biting one's nails.

When a spider-monkey is shot as it sits in a tree, it always coils its tail round a branch at once. And even after it dies, the body will often hang for several days suspended by the tail alone.

These monkeys spend almost the whole of their lives in the trees, feeding upon fruit and leaves, and only coming down to the ground when they want to drink. As a general rule they are dreadfully lazy creatures, and will sit on a bough for hours together without moving a limb. But when they are playful, or excited, they swing themselves to and fro and dart from branch to branch, almost as actively as the gibbons.

HOWLERS

Very much like the spider-monkeys are the howlers, which are very common in the great forests of Central America.

They owe their name to the horrible cries which they utter as they move about in the trees by night. You remember how the gibbons hold a kind of concert in the tree-tops every morning and every evening, as though to salute the rising and the setting sun. Well, the howlers behave in just the same way, except that their concert begins soon after dark and goes on all through the night. They have very powerful voices, and travelers who are not used to their noise say that it is quite impossible to sleep in the forest if there is a troop of howlers anywhere within two miles. And it is hard to believe that the outcry comes from the throats of monkeys at all. "You would suppose," says a famous traveler, "that half the wild beasts of the forest were collecting for the work of carnage. Now it is the tremendous roar of the jaguar, as he springs upon his prey; now it changes to his terrible and deep-toned growlings, as he is pressed on all sides by superior force; and now you hear his last dying groan beneath a mortal wound. One of them alone is capable of producing all these sounds; and if you advance cautiously, and get under the high and tufted trees where he is sitting, you may have a capital opportunity of witnessing his wonderful powers of producing these dreadful and discordant sounds."

If one monkey alone is capable of roaring as loudly as a jaguar, think what the noise must be when fifty or sixty howlers are all howling at the same time. No wonder travelers find it difficult to sleep in the forest.

Perhaps the best known of these monkeys is the red howler. Its color is reddish brown, with a broad band of golden yellow running along the spine, while its face is surrounded by bushy whiskers and beard.

THE OUAKARI

Another very curious American monkey is the red-faced ouakari. If you were to see it from a little distance you would most likely think that it was suffering from a bad attack of scarlet fever; for the face and upper part of the neck are bright red in color, as though they had been smeared with vermilion

paint. And as its whiskers and beard are sandy yellow, it is a very odd-looking animal.

If a ouakari is unwell, strange to say, the bright color of its face begins to fade at once, and very soon after death it disappears altogether.

Ouakaris are generally caught in a very singular way. They are only found in a very small district on the southern bank of the Amazon River, and spend their whole lives in the top-most branches of the tallest trees, where it is quite impossible to follow them. And if they were shot with a gun, of course they would almost certainly be killed. So they are shot with a blow-pipe instead. A slender arrow is dipped into a kind of poison called wourali, which has been diluted to about half its usual strength, and is then discharged at the animal from below. Only a very slight wound is caused, but the poison is still so strong that the ouakari soon faints, and falls from its perch in the branches. But the hunter, who is carefully watching, catches it in his arms as it falls, and puts a little salt into its mouth. This overcomes the effect of the poison, and very soon the little animal is as well as ever.

Ouakaris which are caught in this way, however, are generally very bad-tempered, and the gentle and playful little animals sometimes seen in zoos have been taken when very young. They are very delicate creatures and nearly always die after a few weeks of confinement.

THE COUXIA

If you were to see a couxia, or black saki, as it is often called, the first thing that you would say would most likely be, "What an extraordinary beard!" And your next remark would be, "Why, it looks as if it were wearing a wig!" For its projecting black beard is as big as that of the most heavily bearded man you ever saw, while on its head is a great mass of long black hair, neatly parted in the middle, and hanging down on either side, so that it looks just like a wig which has been rather clumsily made.

The couxia is extremely proud of its beard, and takes very

great pains to prevent it from getting either dirty or wet. Do you remember how the diana monkey holds its beard with one hand while drinking, so as to keep it from touching the water? Well, the couxia is more careful still, for it will not put its lips to the water at all, but carries it to its mouth, a very little at a time, in the palm of its hand. But the odd thing is that it seems rather ashamed of thinking so much about its "personal appearance," and, if it knows that anybody is looking at it, will drink just like any other monkey, and pretend not to care at all about wetting its beard.

Like most of the sakis, the couxia is not at all a good-tempered animal, and is apt to give way to sudden fits of fury. So savagely will it bite when enraged, that it has been known to drive its teeth deeply into a thick board.

THE DOUROUCOULIS

Sometimes these odd little animals are called night-monkeys, because all day long they are fast asleep in a hollow tree, and soon after sunset they wake up, and all night long are prowling about the branches of the trees, searching for roosting birds, and for the other small creatures upon which they feed. They are very active, and will often strike at a moth or a beetle as it flies by, and catch it in their deft little paws. And their eyes are very much like those of cats, so that they can see as well on a dark night as other monkeys can during the day.

The eyes, too, are very large. If you were to look at the skull of a douroucoulis, you would notice that the eye-sockets almost meet in the middle, only a very narrow strip of bone dividing them. And the hair that surrounds them is set in a circle, just like the feathers that surround the eyes of an owl.

But perhaps the most curious fact about these animals is that sometimes they roar like jaguars, and sometimes they bark like dogs, and sometimes they mew like cats.

There are several different kinds of these little monkeys, the most numerous, perhaps, being the three-banded douroucoulis, which has three upright black stripes on its forehead. They are all natives of Brazil and other parts of tropical America.

MARMOSETS

One of the prettiest—perhaps the very prettiest—of all monkeys is the marmoset, which is found in the same part of the world. It is quite a small animal, being no bigger in body than a common squirrel, with a tail about a foot long. This tail, which is very thick and bushy, is white in color, encircled with a number of black rings, while the body is blackish with gray markings, and the face is black with a white nose. But what one notices more than anything else is the long tufts of snow-white hair upon the ears, which make the little animal look something like a white-haired negro.

Marmosets are very easily tamed, and they are so gentle in their ways, and so engaging in their habits, that if only they were a little more hardy we should most likely see them in this country as often as we see pet cats. But they are delicate little creatures, and cannot bear cold. What they like to eat most of all is the so-called black beetle of our kitchens. If only we could keep pet marmosets, they would very soon clear our houses of cockroaches, as these troublesome creatures are correctly called. They will spend hours in hunting for the insects, and whenever they catch one they pull off its legs and wings, and then proceed to devour its body.

When a marmoset is suddenly alarmed, it utters an odd little whistling cry. Owing to this habit it is sometimes known as the ouistiti, or tee-tee.

LEMURS

Relatives of the monkeys, and yet in many respects very different from them, are those very strange animals, the lemurs, which are sometimes called half-apes. The reason why that name has been given to them is this: Lemurs by the ancients were supposed to be ghosts which wandered about by night. Now most of the lemurs are never seen abroad by day. Their eyes cannot bear the bright sunlight; so all day long they sleep in hollow trees. But when it is quite dark

they come out, prowling about the branches so silently and so stealthily that they really seem more like specters than living animals.

When you see them close, they do not look very much like monkeys. Their faces are much more like those of foxes, and they have enormous staring eyes without any expression.

The true lemurs are only found in Madagascar, where they are so numerous that two or three at least may be found in every little copse throughout the island. More than thirty different kinds are known, of which, however, we cannot mention more than two.

The first of these is the ring-tailed lemur, which may be recognized at once by the fact that its tail is marked just like that of the marmoset. The head and body are shaped like those of a very small fox, and the color of the fur is ashy gray, rather darker on the back, and rather lighter underneath. It lives in troops in Central Madagascar, and every morning and every night each troop joins in a little concert, just like the gibbons and the howlers.

But, oddly enough, this lemur is seldom seen in the trees. It lives on the ground, in rough and rocky places, and its hands and feet are made in such a way, as to enable it to cling firmly to the wet and slippery boulders. In fact, they are not at all unlike the feet of a house-fly. The body is clothed with long fur, and when a mother lemur carries her little one about on her back it burrows down so deep into her thick coat that one can scarcely see it at all.

The ruffed lemur is the largest of these curious animals, being about as big as a good-sized cat. The oddest thing about it is that it varies so very much in color. Sometimes it is white all over, sometimes it is partly white and partly black, and sometimes it is reddish brown. Generally, however, the shoulders and front legs, the middle of the back, and the tail are black, or very dark brown, while the rest of the body is white. And there is a great thick ruff of white hairs all round the face.

The eyes of this lemur are very singular. You know, of course, how the pupil of a cat's eye becomes narrower and

narrower in a strong light, until at last it looks merely like an upright slit in the eyeball. Well, that of the lemur is made in very much the same way, except that the pupil closes up from above and below instead of from the sides, so that the slit runs *across* the eyeball, and not up and down.

The slender loris may be described as a lemur without a tail, It is found in the forests of Southern India and Ceylon. It is quite small, the head and body being only about eight inches long, and in general appearance it gives one rather the idea of a bat without any wings. In color it is dark gray, with a narrow white stripe between the eyes.

This animal has a very queer way of going to sleep. It sits on a bough and rolls itself up into a ball with its head tucked away between its thighs, while its hands are tightly folded round a branch springing up from the one on which it is seated. In this attitude it spends the whole of the day. At night it hunts for sleeping birds, moving so slowly and silently among the branches as never to give the alarm, and always plucking off their feathers before it proceeds to eat them. Strange to say, while many monkeys have no thumbs, the slender loris has no forefingers, while the great toes on its feet are very long, and are directed backward instead of forward.

LEMUROIDS

There are two lemur-like animals which are so extraordinary that each of them has been put into a family all by itself.

The first of these is the tarsier, which is found in several of the larger islands in the Malay Archipelago. Imagine an animal about as big as a small rat, with a long tail covered thickly with hair at the root and the tip, the middle part being smooth and bare. The eyes are perfectly round, and are so big that they seem to occupy almost the whole of the face—great staring eyes with very small pupils. The ears are very long and pointed, and stand almost straight up from the head. Then the hind legs are so long that they remind one of those of a kangaroo, while all the fingers and all the toes have large round pads under the tips, which seem to be used as suckers, and to

have a wonderful power of grasp. Altogether, the tarsier scarcely looks like an animal at all. It looks like a goblin.

This singular creature seldom seems to walk. It hops along the branches instead, just as a kangaroo hops on the ground. And when it wants to feed it sits upright on its hind quarters, and uses its fore paws just as a squirrel does.

Even more curious still is the aye-aye, of Madagascar, which has puzzled naturalists very much. For its incisor teeth—the sharp cutting teeth, that is, in the middle of each jaw—are formed just like those of the rat and the rabbit. They are made not for cutting but for gnawing; and as fast as they are worn away from above they grow from beneath. All of its fingers are long and slender; but the middle one is longer than all the rest, and is so thin that it looks like nothing but skin and bone. Most likely this finger, which has a sharp little claw at the tip, is used in hooking out insects from their burrows in the bark of trees. But the aye-aye does not feed only upon insects, for it often does some damage in the sugar plantations, ripping up the canes with its sharp front teeth in order to get at the sweet juices. It is said at times to catch small birds, either for the purpose of eating them or else to drink their blood. And it seems also to eat fruit, while in captivity it thrives on boiled rice.

The aye-aye is about as big as a rather small cat, and its great bushy tail is longer than its head and body put together. It is not a common animal, even in Madagascar, and its name of aye-aye is said to have been given to it on account of the exclamations of surprise uttered by the natives when it was shown to them for the first time by a European traveler. But it is more likely that the name comes from the cry of the animal, which is a sort of sharp little bark twice repeated.

Strange to say, the natives of Madagascar are much afraid of the aye-aye. Of course it cannot do much mischief with its teeth or claws; but they seem to think that it possesses some magic power by means of which it can injure those who try to catch it, or even cause them to die. So that they cannot be bribed to capture it even by the offer of a large reward. Sometimes, however, they catch it by mistake, finding an aye-aye in a

trap which has been set for lemurs. In that case they smear it all over with fat, which they think will please it very much, and then allow it to go free.

The aye-aye is seldom seen in captivity, and when in that state it sleeps all day long.

CHAPTER IV

THE BATS

NEXT in order to the monkeys come the bats, the only mammals which are able to fly. It is quite true that there are animals known as flying squirrels, which are sometimes thought to have the power of flight. But all that these can do, as we shall see by and by, is to take very long leaps through the air, aided by the curious manner in which the loose skin of the body is fastened to the inner surface of the legs.

HOW BATS FLY

Bats, however, really can fly, and the way in which their wings are made is very curious. If you were to look at a bat's skeleton, you would notice, first of all, that the front limbs were very much larger than the hinder ones. The upper arm-bone is very long indeed, the lower arm-bone is longer still, and the bones of the fingers are longest of all. The middle finger of a bat, indeed, is often longer than the whole of its body! Now these bones form the framework of the wing. You know how the silk or satin of a lady's fan is stretched upon the ribs. Well, a very thin and delicate skin is stretched upon the bones of a bat's arm and hand in just the same way. And when the little animal wants to fly, it stretches its fingers apart, and so spreads the wing. When it wants to rest it closes them, and so folds it against its body.

Then you would notice that a high bony ridge runs down the bat's breast-bone. Now such a ridge as this always signifies great strength, because muscles must be fastened at each end to bones; and when the muscles are very large and powerful, the bones must be very strong in order to carry them. So, when an animal needs very strong breast-muscles, so that it may be able to fly well, we always find a high bony ridge running

down its breast-bone; and to this ridge the great muscles which work the wings are fastened.

Something more is necessary, however, if the animal is to fly properly. It must be able to steer itself in the air just as a boat has to be steered in the water. Otherwise it would never be able to fly in the right direction. So nature has given it a kind of air-rudder; for the skin which is stretched upon the wings is carried on round the end of the body, and is supported there, partly by the hind legs, and partly by the bones of the tail. And by turning this curious rudder to one side or the other, or tilting it just a little up or a little down, the bat is able to alter its course at will.

THE USEFUL CLAW

But you would notice something else on looking at a bat's skeleton. You would notice that the bones of the thumb are not long and slender, like those of the fingers, but that they are quite short and stout, with a sharp hooked claw at the tip. The bat uses this claw when it finds itself on the ground. It cannot walk, of course, as it has no front feet; so it hitches itself along by means of its thumbs, hooking first one claw into the ground and then the other, and so managing to drag itself slowly and awkwardly forward.

It is not at all fond of shuffling along in this way, however, and always takes to flight as soon as it possibly can. But as it cannot well rise from the ground it has to climb to a little height and let itself drop, so that as it falls it may spread its wings and fly away. And it always climbs in a very curious manner, with its tail upward and its head toward the ground, using first the claws of one little foot and then those of the other.

When a bat goes to sleep it always hangs itself up by the claws of its hind feet. In an old church tower, or a stable loft, you may often find bats suspended in this singular way. And there is a reason for it. The bat wants to be able, at the first sign of danger, to fly away. Now if it lay flat upon the ground to sleep, as most animals do, it would not be able to fly quickly; for it would have to clamber up a wall or a post to some little

height before it could spread its wings. And this would take time. But if it should be alarmed while it is hanging by its hind feet, all that it has to do is to drop into the air and fly off at once.

BATS IN THE DARK

There is something else, too, that we must tell you about bats. They have the most wonderful power of flying about on the darkest night, without ever knocking up against the branches of trees, or any other obstacles which they may meet on their way. It used to be thought that this was because they had very keen eyes. But it has been found out that even a blind bat has this power, which seems really to be due to very sensitive nerves in the wings. You can feel a branch by touching it. But a bat is able to feel a branch *without* touching it, while it is eight or ten inches away, and so has time to swerve to one side without striking against it.

THE WINTER SLEEP

Bats, like hedgehogs and squirrels, pass through the winter in a kind of deep sleep, which we call hibernation. It is more than ordinary sleep, for they do not require any food for months together, while they scarcely breathe once in twenty-four hours, and their hearts almost cease to beat. If the winter is cold throughout, they do not wake at all until the spring. But two or three hours' warm sunshine arouses them from their slumber. They wake up, feel hungry, go out to look for a little food, and then return to their retreats and pass into the same strange sleep again.

AN INTERESTING SPECIMEN

"I once kept a long-eared bat as a pet," says a writer, "and a most interesting little creature he was. One of his wings had been injured by the person who caught him, so that he could not fly, and was obliged to live on the floor of his cage. Yet,

although he could take no exercise, he used to eat no less than seventy large bluebottle flies every evening. As long as the daylight lasted, he would take no notice of the flies at all. They might crawl about all over him, but still he would never move. But soon after sunset, when the flies began to get sleepy, the bat would wake up. Fixing his eyes on the nearest fly, he would begin to creep toward it so slowly that it was almost impossible to see that he was moving. By degrees he would get within a few inches. Then, quite suddenly, he would leap upon it, and cover it with his wings, pressing them down on either side of his body so as to form a kind of tent. Next he would tuck down his head, catch the fly in his mouth, and crunch it up. And finally he would creep on toward another victim, always leaving the legs and the wings behind him, which in some strange way he had managed to strip off, just as we strip the legs from shrimps.

"I often watched him, too, when he was drinking. As he was so crippled, I used to pour a few drops of water on the floor of his cage, and when he felt thirsty he would scoop up a little in his lower jaw, and then throw his head back in order to let it run down his throat. But in a state of freedom bats drink by just dipping the lower jaw into the water as they skim along close to the surface of a pond or a stream, and you may often see them doing so on a warm summer's evening."

THE PIPISTRELLE

The pipistrelle, a common European bat, is said to feed chiefly upon gnats, of which it must devour a very large number, and as it much prefers to live near human habitations, there can be no doubt that it helps to keep houses free from these disagreeable insects. In captivity it will feed freely upon raw meat chopped very small. It appears earlier in the spring than the other bats, and remains later in the autumn.

HORSESHOE BATS

These bats of the Old World have a most curious leaf-like membrane upon the face, which gives them a very odd ap-

pearance. In the great horseshoe bat this membrane is double, like one leaf placed above another. The lower one springs from just below the nostrils, and spreads outward and upward on either side, so that it is shaped very much like a horseshoe, while the upper one is pointed and stands upright, so as partly to cover the forehead. The ears, too, are very large, and are ribbed crosswise from the base to the tips; so that altogether this bat is a strange-looking creature.

Perhaps none of the bats is more seldom seen than this, for it cannot bear the light at all, and never comes out from its retreat until darkness has quite set in. And one very seldom finds it asleep during the day, for it almost always hides in dark and gloomy caverns, which are hardly ever entered by any human being. In France, however, there are certain caves in which great numbers of these bats congregate together for their long winter sleep. As many as a hundred and eighty of them have been counted in a single colony. And it is a very strange fact that all the male bats seem to assemble in one colony, and all the female bats in another.

VAMPIRES

In Central and South America, and also in the West Indian Islands, a number of bats are found which are known as vampires. Some of these eat insects, just like the bats of other countries, and one of them—known as the long-tongued vampire—has a most singular tongue, both very long and very slender, with a brush-like tip, so that it can be used for licking out insects from the flowers in which they are hiding. Then there are other vampires which eat fruit, like the flying foxes, about which we shall have something to tell you soon. But the best known of these bats, and certainly the strangest, are those which feed upon the blood of living animals.

If you were to tether a horse in those parts of the forest where these vampires live, and to pay it a visit just as the evening twilight was fading into darkness, you would be likely to see a shadowy form hovering over its shoulders, or perhaps even clinging to its body. This would be a vampire bat; and when

you came to examine the horse, you would find that, just where you had seen the bat, its skin would be stained with blood. For this bat has the singular power of making a wound in the skin of an animal, and sucking its blood, without either alarming it or appearing to cause it any pain. And if a traveler in the forest happens to lie asleep in his hammock with his feet uncovered, he is very likely to find in the morning that his great toe has been bitten by one of these bats, and that he has lost a considerable quantity of blood. Yet the bat never wakes him as it scrapes away the skin with its sharp-edged front teeth.

Strangely enough, however, there are many persons whom vampires will never bite. They may sleep night after night in the open, and leave their feet entirely uncovered, and yet the bats will always pass them by. Charles Waterton, a famous English traveler, was most anxious to be bitten by a vampire, so that he might learn by his own experience whether the infliction of the wound caused any pain. But though he slept for eleven months in an open loft, through which the bats were constantly passing, they never attempted to touch him, while an Indian lad who slept in the same loft was bitten again and again.

But as these bats cannot always obtain blood, it is most likely that they do not really live upon it, but only drink it when they have the chance, and that as a rule their food consists of insects.

FLYING FOXES

Of course these are not really foxes. They are just big bats which feed on fruit, instead of on insects or on blood. They are called also fruit-bats. But their long, narrow faces are so curiously fox-like that we cannot feel surprised that the name of flying foxes should have been given to them.

Flying foxes are found in many parts of Asia, as well as in Madagascar and in Australia, and in some places they are very common. In India, long strings of these bats may be seen regularly every evening, as they fly off from their sleeping places to the orchards in search of fruit. In some parts of India, early in the morning, and again in the evening, the sky is often black with them as far as the eye can reach, and they

continue to pass overhead in an unbroken stream for nearly three-quarters of an hour. And as they roost in great numbers on the branches of tall trees, every bat being suspended by its hinder feet, with its wings wrapped round his body, they look from a little distance just like bunches of fruit.

It is rather curious to find that when they are returning to the trees in which they roost, early in the morning, these bats quarrel and fight for the best places, just as birds do.

In districts where they are at all plentiful, flying foxes do a great deal of mischief, for it is almost impossible to protect the orchards from their attacks. Even if the trees are covered all over with netting they will creep underneath it, and pick out all the best and ripest of the fruit; while, as they only pay their visits of destruction under cover of darkness, it is impossible to lie in wait for them and shoot them as they come.

The flight of the fruit-bats is not at all like that of the bats with which we are familiar, for as they do not feed upon insects there is no need for them to be constantly changing their course, and darting first to one side and then to the other in search of victims. So they fly slowly and steadily on, following one another just as crows do, and never turning from their course until they reach their feeding-ground.

The largest of these fruit-bats is the kalong, which is found in the islands of the Malay Archipelago. It measures over five feet from tip to tip of the extended wings. The Malays often use it for food, and its flesh is said to be delicate and well flavored.

CHAPTER V

THE INSECT-EATERS

NEXT to the bats comes the important tribe of the insect-eaters, containing a number of animals which are so called because most of them feed chiefly upon insects.

THE COLUGO

One of the strangest of these is the colugo, which lives in Siam, Java, and the Islands of the Malay Archipelago. It is remarkable for its wonderful power of leaping, for it will climb a tall tree, spring through the air, and alight on the trunk of another tree seventy or eighty yards away. For this reason it has sometimes been called the "flying colugo"; but it does not really fly. It merely skims from tree to tree. And if you could examine its body you would be able to see at once how it does so.

First of all, you would notice that the skin of the lower surface is very loose. You know how loose the skin of a dog's neck is, and how you can pull it up ever so far from the flesh. Well, the skin of the colugo is quite as loose as that on the sides and lower parts of its body.

Then you would notice that this loose skin is fastened along the inner side of each leg, so that the limbs are connected by membrane just like the toes of a duck's foot. And you would also see that when the legs are stretched out at right angles to the body, this membrane must be stretched out with them.

Now when a colugo wishes to take a long leap, it springs from the tree on which it is resting, spreads out its limbs, and skims through the air just as an oyster-shell does if you throw it sideways from the hand. The air buoys it up, you see, and enables it to travel ten times as far as it could without this loose skin. But of course this is not flight. The animal does not

beat the air with the membrane between the legs, as bats and birds do with their wings. It cannot alter its course in the air; and it is always obliged to alight at a lower level than that from which it sprang.

The colugo is about as big as a good-sized cat, and its fur is olive or brown in color, mottled with whitish blotches and spots. When it clings closely to the trunk of a tree, and remains perfectly motionless, it may easily be overlooked, for it looks just like a patch of bark covered with lichens and mosses. It is said to sleep suspended from a branch with its head downward, like the bats; and whether this is the case or not, its tail is certainly prehensile, like that of a spider-monkey. And strangest of all, perhaps, is the fact that, although it belongs to the group of the insect-eaters, it feeds upon leaves.

THE HEDGEHOG

In European countries, where it is common, one can scarcely walk through the meadows on a summer's evening without seeing this curious animal as it moves clumsily about in search of prey. There everybody is familiar with its spiky coat, which affords such an excellent protection against almost all its enemies.

But it is not everybody who knows how the animal raises and lowers its spines. It has them perfectly under control; we all know that. If you pick a hedgehog up it raises its spines at once, even if it does not roll itself up into a ball and so cause them to project straight out from its body in all directions. But if you keep the creature as a pet, and treat it kindly, it will very soon allow you to handle it freely without raising its spines at all.

The fact is this. The spines are shaped just like slightly bent pins, each having a sort of rounded head at the base. And they are pinned, as it were, through the skin, the heads lying underneath it. Besides this, the whole body is wrapped up in a kind of muscular cloak, and in this the heads of the spines are buried. So if the muscle is pulled in one direction, the spines must stand up, because the heads are carried along with it. If

it is pulled in the other direction they must lie down, for the same reason. And it is just by pulling this muscle in one direction or the other that the animal raises and lowers its spines.

HEDGEHOG HABITS

The hedgehog is not often seen wandering about by day, because it is then fast asleep, snugly rolled up in a ball under the spreading roots of a tree, or among the dead leaves at the bottom of a hedge. But soon after sunset it comes out from its retreat, and begins to hunt about for food. Sometimes it will eat bird's eggs, being very fond of those of the partridge; for which reason it is not at all a favorite with the gamekeeper. It will devour small birds, too, if it can get them, also lizards, snails, slugs, and insects. It has often been known to kill snakes and to feed upon their bodies afterward. It is a cannibal, too, at times, and will kill and eat one of its own kind. But best of all it likes earthworms.

The number of these which it will crunch up one after another is astonishing. "I once kept a tame hedgehog," says a naturalist, "and fed him almost entirely upon worms; and he used to eat, on an average, something like an ordinary jam-potful every night of his life. He never took the slightest notice of the worms as long as the daylight lasted; but when it began to grow dark he would wake up, go sniffing about his cage till he came to the jam-pot, and then stand up on his hind feet, put his fore paws on the edge, and tip it over. And after about an hour and a half of steady crunching, every worm had disappeared."

In many places farmers persecute the hedgehog, and kill it whenever they have a chance of doing so. And if you ask the reason the answer is generally to the effect that hedgehogs steal milk from sleeping cows at night. Now it does not seem very likely that a cow would allow such a spiky creature as a hedgehog to come and nestle up against her body. But, on the other hand, it cannot be denied that hedgehogs are often to be seen close by cows as they rest upon the ground. But they have not gone there in search of milk. Don't you know what happens if you lay a heavy weight, such as a big paving-stone, on the

ground? The worms buried under it feel the pressure, and come up to the surface in alarm. Now a cow is a very heavy weight; so that when she lies down a number of worms are sure to come up all round her. And the hedgehog visits the spot in search, not of milk, but of worms!

The young of the hedgehog, which are usually four in number, do not look in the least like their parents, and you might easily mistake them for young birds; for their spikes are very soft and white, so that they look much more like growing feathers. The little creatures are not only blind, but also deaf, for several days after birth, and they cannot roll themselves up till they have grown somewhat. The mother animal always makes a kind of warm nest to serve as a nursery, and thatches it so carefully that even a heavy shower of rain never seems to soak its way through.

Strange to say, the hedgehog appears to be quite unaffected by many kinds of poison. It will eat substances which would cause speedy death to almost any other animal. And over and over again it has been bitten by a viper without appearing to suffer any ill results.

In England, about the middle of October, the hedgehog retires to some snug and well-hidden retreat, and there makes a warm nest of moss and dry leaves. In this it hibernates, just as bats do in hollow trees, only waking up now and then for an hour or two on very mild days, and often passing three or four months without taking food.

SHREWS

During the earlier part of the autumn, you may very often find a curious mouse-like little animal lying dead upon the ground. But if you look at it carefully, you will see at once that in several respects it is quite different from the true mice.

In the first place you will notice that its mouth is produced into a long snout, which projects far in front of the lower jaw. Now no mouse ever has a snout like that. Then you will find that all its teeth are sharply pointed, while the front teeth of a mouse have broad, flat edges specially meant for nibbling

at hard substances. And, thirdly, you will see that its tail, instead of gradually tapering to a pointed tip, is comparatively short, and is squared in a very curious manner. The fact is that the little animal is not a mouse at all, but a kind of shrew, of which there are many American species. One is large, and pushes through the top-soil like a mole. Another, smaller, is blackish, and has a short tail. The commonest one is mouse-gray and only two inches long plus a very long tail. It is fond of water, but has no such interesting habits as those of the European shrew next described.

These creatures are very common almost everywhere. But we very seldom see them alive, because they are so timid that the first sound of an approaching footstep sends them away into hiding. Yet they are not at all timid among themselves. On the contrary, they are most quarrelsome little creatures, and are constantly fighting. If two shrews meet, they are almost sure to have a battle, and if you were to try to keep two of them in the same cage, one would be quite certain to kill and eat the other before very long. They are not cannibals as a rule, however, for they feed upon worms and insects, and just now and then upon snails and slugs. And no doubt they do a great deal of good by devouring mischievous grubs.

Why these little animals die in such numbers just at the beginning of the autumn, nobody quite seems to know. It used to be thought that they were killed by cats, or hawks, or owls, which refused to eat them because of some unpleasant flavor in their flesh. But then one never finds any mark of violence on their bodies. A much more absurd idea was that they always die if they run across a path which has been trodden by the foot of man! Perhaps the real reason may be that just at that season of the year they perish from starvation.

THE WATER-SHREW

The best way to see this pretty little creature is to go and lie down on the bank of a stream, and to keep perfectly still for five or ten minutes. If you do this—not moving even a finger—

you will very likely see half a dozen or more of the little animals at play. They go rushing about in the wildest excitement, chasing one another, tumbling over one another, and uttering curious little sharp, short squeaks, just like a party of boys let out from school after a long morning's work. Suddenly one will dash into the water and dive, quickly followed by another and then by a third. As they swim away beneath the surface they look just like balls of quicksilver, because their soft, silky fur entangles thousands of little air-bubbles, which reflect back the light just as a looking-glass does. And you will notice that they do not swim straight. First they turn to one side, and then to the other side, exactly like some one who has just learned to ride a bicycle, but does not yet know how to keep the front wheel straight. And the reason is this. The shrew swims by means of its hind feet, which are fringed with long hairs, so as to make them more useful as paddles; and it uses them by striking out first with one and then with the other. The consequence is that when it strikes with the right foot its head turns to the left, while when it strikes with the left foot its head turns to the right.

But it would not be able to swim even as straight as it does if it were not for its tail, which is fringed with long hairs just like the hind feet. And as the little animal paddles its way through the water it keeps its tail stretched out behind it, and uses it as a rudder, turning it a little bit to one side or the other, so as to help it in keeping its course.

After chasing one another under water for a minute or two, the little animals give up their game. And now, if you watch them carefully, you can see them hunting for food. First they go to one stone down at the bottom of the stream, and then to another, poking their long snouts underneath in search of fresh-water shrimps, or the grubs of water-insects. But a minute or two later they are all back on the bank again, dashing about and chasing one another and squeaking as merrily as ever.

Sometimes you may see a water-shrew which is very much darker in color than the others, the fur on the upper part of its body being almost black. It used to be thought that such ani-

mals as this belonged to a different species, to which the name of oared shrew was given. But we know now that they are only dark varieties of the common water-shrew.

JUMPING SHREWS

These are all found in Africa. They are curious little creatures with extremely long hind feet, by means of which they leap along just as if they were tiny kangaroos. So swift are they, that it is very difficult for the eye to follow their movements. And as they disappear into their burrows at the slightest alarm and do not come out again for some little time, few people ever have a chance of watching their habits.

The snouts of these shrews are so very long that the little animals are often known as elephant-shrews.

TREE-SHREWS

This is a group so called because they spend almost the whole of their lives in the trees. In some ways they are not unlike tiny squirrels, being nearly as active in their movements, and sitting up on their hind quarters to feed, while the food is held in their fore paws. They are found in various parts of Southern Asia. They soon become very tame, actually entering houses, and climbing up on the table while the occupants are sitting at meals. They will even drink tea and coffee out of the cups! And if they are encouraged they make themselves quite at home, and will drive away any other tree-shrews which may venture into the house.

The largest animal of this group is the tupaia, which lives in Borneo and Sumatra. But the most curious is the pen-tailed tree-shrew, which has a double fringe of long hairs at the end of its tail, arranged just like the barbs of a feather, so that its tail looks very much like a quill pen. The rest of the tail, which is very long, is covered with square scales; and while the tail itself is black, the fringe of hairs is white, so that the appearance of the animal is very odd. It is found in Sarawak, and also in some of the smaller islands of the Malay Archipelago.

THE DESMAN

This animal may be described as a kind of mixture of the elephant-shrew and the water-shrew; for it has an extremely long and flexible snout, and it spends almost its whole life in the water. Its feet are very well adapted for swimming, the toes being joined together by a web-like membrane like those of the duck and the swan, so that they form most exquisite paddles. And the animal is so fond of the water that, although it lives in a burrow in the bank of a stream, it always makes the entrance below the surface.

This is a very good plan in one way, for if the little animal is chased by one of its enemies, it can easily take refuge in its long, winding tunnel, which twists about so curiously, and has so many side passages, that the pursuer is almost sure to be baffled. But in another way it is a bad plan, for as the burrow has no entrance except the one under water, it never gets properly ventilated, the only connection with the outer air being some chance cranny in the ground. And in winter-time, when deep snow has covered up this cranny, while the surface of the stream is frozen to a depth of several inches, the poor little desman can get no fresh air at all, and often dies in its own burrow from suffocation.

This animal has a curious musky odor, which is due to certain glands near the root of the tail. So strong is this odor, that if a pike happens to have swallowed a desman a few days before it is caught, its flesh cannot be eaten, for its whole body both smells and tastes strongly of musk. Two kinds of desman are known. One is the Russian desman, which is found in the steppes, and the other is the Pyrenean desman, which lives in the range of mountains from which it takes its name.

THE COMMON MOLE

This is perhaps the most interesting of all the insect-eaters. Have you ever noticed how wonderfully it is suited for a life which is almost entirely spent under the ground?

Notice, first of all, the shape of its body. It is a pointed cylinder. Now that is the very best shape for a burrowing animal, because it offers so little resistance to the ground as the creature forces its way along. And nowadays we make all our boring tools and weapons of that shape. The gimlet, which has to bore through wood; the bullet, which has to bore through air; the torpedo and the submarine boat, which have to bore through water—they are all made in the form of pointed cylinders. And the mole is a pointed cylinder too. Its body is the cylinder, and its head is the point; and so the animal is able to work its way through the soil with as little difficulty as possible.

Then notice the character of its fur. It has no “set” in it. You can stroke it backward or forward with equal ease. And this is most important in an animal which lives in a burrow. If a mole had fur like that of a cat, it would be able to travel head foremost through its tunnel quite easily; but it could not move backward. And this would never do, for sometimes the mole is attacked by an enemy in front, while it has no room to turn round in order to retreat. So nature has made its fur in such a way that it “gives” in either direction, and enables the little animal to move either forward or backward with equal ease.

A WONDROUS DIGGER

See what wonderful front paws the mole has—so broad, so very strong, and armed with such great, stout claws. They are partly pickaxes, and partly spades, which can tear away the earth and fling it up into molehills with the most wonderful speed. The rapidity with which a mole can dig is really marvelous. “Three times,” a writer tells us, “I have seen moles walking about on the ground. Each time I was within ten yards of the animal; each time I ran to the spot. And yet each time the little creature had disappeared into the ground before I could get there! It did not seem to be digging. It simply seemed to sink into the soil, just as though it were sinking into water.

Then just see how hard and horny the skin of the paws is.

If it were not for this, the mole would be always cutting itself with sharp flints as it dug its way through the ground. Notice, too, how both the eyes and ears are hidden away under the fur, so that fragments of earth may not fall into them. Nature has been very careful to suit the mole to the strange life which she calls upon it to lead.

Perhaps no animal is so strong for its size as the mole. Its muscles and sinews are so hard that they will turn the edge of a knife. If a mole could be magnified to the size of a lion or a tiger, and its strength could be increased in corresponding degree, it would be by far the more powerful animal of the two.

THE MOLE AND ITS FOOD

The reason why the mole is so strong, and so well suited for a life underground, is that it is meant to feed partly upon worms, and partly upon such grubs as wireworms, which live on the roots of plants. And the appetite of the animal is astonishing. It is ever eating, and yet never appears to be satisfied. Don't think of keeping a mole as a pet; because if you do, you will have to spend almost the whole of your time in digging up worms for it to eat! Mole-catchers say, indeed, that if a mole goes without eating for three hours it is in danger of starvation. So that the animal must spend the greater part of the day, and of the night too, in searching for food.

How does it find the worms and grubs? Well, of course it cannot see underground; so sometimes, we may think, it smells them, for its scent is certainly very keen. But oftener, most likely, it hears them moving about; for its ears are even keener still. Haven't you noticed that, although you may often walk through fields which are almost covered with molehills, you never see the earth being thrown up? That is because the mole hears you coming. It hears your footsteps when you are a hundred yards distant, or even more, and immediately stops work until you have gone away again. In "The Tempest," Caliban tells his companions to "tread softly, that the blind mole may not hear a footfall." Although Shakespeare was wrong in thinking

that moles are blind, he was quite right in reminding us that they have very sharp ears.

FRIEND OR FOE?

The gardener, of course, looks upon the mole as a foe; and so it is when it drives its tunnels under our lawns, and throws up great heaps of earth on the surface of the grass. And the farmer regards it as a foe too, and kills it whenever he has an opportunity. But perhaps the farmer may not know what a busy little animal the mole is, and what thousands and thousands of mischievous grubs it devours. There are wireworms, which nibble away at the roots of plants till they kill them, and then move on to destroy other plants in the same way. There are "leather-jackets," or daddy-long-legs grubs, which feed upon the roots of grass, and sometimes ruin all the turf in a meadow. There are also the great fat white grubs of beetles, which are worse, perhaps, than either; and many others as well. Now the mole is always preying upon these. It eats them in hundreds every day of its life. And just think of all the mischief that they would have done if they had been allowed to live! No doubt it is annoying to the farmer to have molehills among his hay, which blunt the knives of the reaping-machines, and prevent them from cutting properly. But even that is better than having no hay to cut; and there would be none if all these mischievous grubs were allowed to live.

But there is another way as well in which the mole is useful; for the earth which it digs up from down below, and throws up in heaps on the surface of the ground, serves for what the farmer calls a top-dressing. After a time, you see, the nourishment in the soil at the surface is sucked out of it by the roots of the grass. If it were in a garden, the farmer could dig it. If it were in a corn-field, or a turnip-field, he could plow it. But in a meadow, he can do neither, without destroying the pasture. So he applies a top-dressing. He gets some good, rich earth from elsewhere, and spreads it over the surface; and this earth works down to the grass-roots, and gives them just the nourishment they require.

Now this is exactly what the mole is always doing. The earth which it throws up is fresh, rich earth from down below, which the roots have not reached. It is just what the failing grass requires. And if the farmer rakes the molehills down, so as to spread this earth evenly over the surface of the field, he finds that it forms a top-dressing quite as good as any he could apply himself. So instead of looking upon the mole as one of his enemies, he ought to include it in the list of his laborers.

THE LITTLE WELL-DIGGER

Another thing that we must tell you about the mole is the way in which it obtains water. It is a very thirsty animal, and constantly requires to drink. At the same time, it cannot leave its burrow half a dozen times a day, in order to visit a stream or a pond, for it would almost certainly be killed by one of its many enemies. So it actually digs little wells of its own, always doing so in the dampest parts of its tunnels, where they fill up almost immediately. And when it wants to drink it just goes off to the nearest of these wells and satisfies its thirst.

THE MOLE'S FORTRESS

But the most wonderful thing that the mole does is to make what we call a fortress, surrounding the chamber in which it sleeps. This fortress is situated either in a natural mound of earth, or else beneath the spreading roots of a tree or a large bush; and it is made in this way: First the mole digs a short circular gallery. A little way under this it digs another, rather larger in diameter, and connects the two by means of five short passages. In the middle of the mound, and about half-way between the two galleries, it scoops out a large round hole, from which three passages run to the lower gallery. This is the mole's bedroom, and it communicates with the main burrow by a tunnel which dips under the lower gallery. Finally, a number of runs branch out from the lower gallery in all directions.

So, you see, if a mole is chased by an enemy, it can nearly

always escape by passing through its fortress. It goes up one passage, down another, up again by a third, down again by a fourth, and then off by one of the side runs; so that its pursuer is almost sure to be bewildered. And if the little animal should be surprised while asleep, it can escape in any direction without losing even a moment.

As the mole always likes to make itself comfortable, it collects together a quantity of dry grass, moss, and leaves, and piles them up in the central chamber, so as to make a warm and cosy bed! And the female mole makes a nursery for her little ones in much the same way.

FIERCE FIGHTERS

Sad to say, moles are very quarrelsome little animals, and frequently fight when they meet. Here is an account of one of their battles, written by a passer-by who happened to witness it.

"Walking along a quiet lane, I heard some very funny little squeaks proceeding from the other side of the hedge. I am perfectly used to all sorts of animal and bird sounds, but had never heard the like of these before. On getting cautiously over the hedge, I found two moles fighting in the ditch. I went to within two yards of them, but they took not the slightest notice of me, so intent were both on their business. I at once looked at my watch. They kept on, up and down, scratch and bite, for seven minutes, when one turned the other completely over on his back, and seized him by the throat, which he cut as cleanly as if done by a knife, thus finishing the fight. The way in which they used their formidable front feet was surprising."

THE STAR-NOSED MOLE

This mole is found in the United States and Canada. It is a very odd-looking animal, for its muzzle is shaped into a long snout, at the tip of which is a circle of fleshy rays of a rosy red color, which look like the petals of a red daisy, or the spreading

arms of a sea-anemone. These rays can be opened wide or closed up at pleasure, and seem to serve as very delicate organs of touch, helping the animal in finding and catching its prey.

This mole is also remarkable for having a very long tail, which is more than half the length of the head and body. The total length is about seven inches.

CHAPTER VI

THE LARGER CATS

NOW we come to the beasts of prey, foremost among which stand the members of the great cat tribe. All these animals have their bodies formed in a very wonderful way.

First of all, their eyes are intended for use chiefly by night. If you look at a cat's eyes during broad daylight, when the sun is shining, you will notice that the pupils, through which she sees, are nothing more than mere narrow slits in the middle. Look at them again toward evening, when the twilight is just beginning to creep on, and you will see that the pupils are a good deal bigger, occupying nearly half the eyeball. Look at them once again, when it is almost dark, and you will find that they are bigger still, having widened out over nearly the whole of the eye.

Now the eyes of a lion and a tiger are made in just the same way. The darker the night, the more the pupils expand, so that they may be able to take in the few rays of light that there are. We sometimes say that these animals can see in the dark. That, of course, is a mistake, for in perfect darkness no animal can see at all. But even on the darkest night there is always some light, and no matter how little there is it is enough to allow lions and tigers to see perfectly well, because of the wonderful way in which their eyes are made.

THE STEALTHY TREAD

But these creatures do not only want to be able to see their victims on a dark night; they also want to be able to creep up to them without making the slightest sound. It would be quite useless, for instance, for a lion to chase a deer, because the deer is by far the swifter animal of the two. If the lion is to catch the deer at all he must spring upon it unawares, and strike it

down before it knows its danger. And this is not at all easy, for the ears of a deer are very sharp, and if the lion were to make the least noise while creeping up, it would take the alarm directly. But under his great broad paws the lion has soft, fleshy cushions, which enable him to walk along without making any noise at all. Haven't you noticed how silent a cat's tread is? You simply cannot hear her place her foot upon the ground. Well, lions and tigers walk in just the same noiseless manner, so that the deer never hears them creeping up, and is struck down and killed before it has time to realize its danger.

But suppose that there are bushes in the way. Suppose, for example, that in order to approach the deer at all the lion must creep through a thicket. Is he not quite sure to brush up against a branch as he does so, causing the leaves to rustle? And will not the deer hear the sound and take the alarm?

Well, no doubt this would happen if the lion had to depend for his silent approach only on the soft cushions under his feet. But then, you see, he has whiskers as well! Perhaps you thought these were only meant for ornament. But they are meant for use; and they are employed in a very curious manner. When they are spread out on either side, they measure from tip to tip exactly the width of the body. Besides this, there is a very delicate sensitive nerve at the root of every whisker, which runs straight to the brain. So, you see, if the tip of a whisker is touched, the brain feels it directly; and if as the lion is creeping through the bushes his outspread whiskers brush against the branches, he knows at once that there is no room for him to pass without making a noise and alarming his victim. So he draws his head back, and creeps up by another way.

KILLING AND EATING

Then it is very important that his claws should be kept sharp; for he depends upon them for tearing his victim down. So every claw fits into a sheath, which protects the point, and prevents it from being worn down by rubbing against the ground. You can easily see these sheaths by examining the paw of a cat; and those of the lion and tiger are formed in just the same way.

And the muscles which work them are so arranged that they keep the claws always drawn back, except just when the animal uses its paw in striking.

And then, once more, these animals have very curious tongues. Haven't you noticed when a cat has licked your hand how very dry and rough her tongue feels? It is quite different from the smooth, wet tongue of a dog. Well, the tongue of a lion or tiger is even rougher still; and if you were to look at it sideways, you would see why. It is covered all over with sharp hook-like projections, the points of which are directed toward the throat.

The reason is this: a lion or a tiger does not succeed in killing prey every night. Sometimes it hunts for one night, sometimes for two nights, sometimes even for three nights, without any success at all. So that when it does catch a victim, it wants to eat as much of its flesh as it possibly can. And if its tongue were not made in this singular manner, it would have to waste a great deal; for its sharp-pointed teeth cannot tear off nearly all the flesh of the bones. By means of its rough tongue, however, it can lick off even the tiniest scraps; and not even the smallest atom has to be wasted.

If you give a dog a bone which is too big for him to crunch up and swallow, you will always find that he leaves a good deal of meat upon it. But if you give a similar bone to a hungry cat, you will find that she licks it perfectly clean. That is because her tongue is made in just the same way as that of a lion.

LIONS

About forty different kinds of cats are known, most of which are found in the warmer parts of Africa and Asia. The most famous of all, of course, is the lion, which is spread over the greater part of the African continent, and is also found in Persia and in India.

We need not describe the lion, for everybody knows perfectly well what it is like. But perhaps you do not know that the Indian lion hardly ever has a mane. For this reason it was formerly thought that there were two different kinds of lions,

the Indian animal being quite different from that found in Africa. But we now know that this is not the case, and that the Indian lion is only a kind or variety, not a distinct species.

But there are very few lions left in India now, while even in Persia they are not nearly so plentiful as they used to be. In many parts of Africa, however, these animals abound, and it is not at all an uncommon thing for six or eight to be seen together.

During the daytime the lion is generally fast asleep, lying up in a thicket, or in a bed of reeds by the side of a pool or a river. But as soon as night falls he leaves his retreat, and begins to prowl about in search of prey, roaring loudly from time to time. One would think that this would only alarm other animals, and lead them to seek safety in flight. But when a lion roars he generally puts his head close to the ground, and this has the effect of making it almost impossible for them to tell from which direction the sound is coming, so that they do not know how best to try to escape him. And very often, in their bewilderment, they rush to the very spot where he is lying in wait.

When a lion springs upon his victim, he either kills it by a stroke from his terrible paw, or else bites it in the throat or across the back of the neck. He then drags it away to some convenient retreat, eats his fill, and returns to his lair to sleep. Next day, very likely, he will return to the carcass for another meal. But when he gets there he often finds that the jackals and hyenas have discovered it, and left very little for him.

Wherever a lion goes he is almost sure to be followed by a number of jackals, all anxious to feast on the remains of the animals he kills. But he never allows them to approach until he has eaten as much as he can possibly swallow, and it is said that if one of them attempts to do so he will catch it and bite off all its paws as a warning to the others to be more respectful.

According to a great many hunters, the lion is not nearly so courageous as it is generally supposed to be, and is really rather a cowardly animal. They say, for example, that it will hardly ever face a man unless it is brought to bay, but will always try to slink away and escape. If they kill a deer, and want to protect its body from the lions, they can always do so by tying two

or three streamers of white cloth to sticks planted round the carcass, so that they flutter in the wind. And though the animals may prowl round and round all through the night, roaring loudly from time to time, they will never venture to approach within fifteen or twenty yards. Neither will they attack a tethered horse if the bridle is left hanging from its neck.

All hunters agree, however, that if a lion is wounded, or if it sees no chance of escape, it is a most terrible foe, and cannot be encountered without the utmost peril.

If a lion is captured while quite young, it is very easily tamed, and can even be taught to perform all kinds of tricks at the word of command. But lions born in captivity are not nearly so easy to manage, and can never be depended upon for a moment.

Lions generally have three or four cubs at a birth, and the little animals are just as playful at kittens. But although they are always ready for a good romp it is not wise to play with them, for a baby lion is as big as a good-sized cat, and is very much stronger, so that a bite from its teeth or a blow from its paw is rather a serious matter. For the first few months of their lives the cubs are brindled, almost like tigers, the stripes disappearing by degrees as the fur grows darker. They do not reach their full size until they are about four years old.

TIGERS

The tiger is found principally in the jungles of India, although it is spread over the greater part of Central and Southern Asia. In some respects it is a finer animal than even the lion. It is certainly stronger; it is quite as courageous; and it is nearly as large, though the shortness of its legs and the absence of a mane cause it to appear a good deal smaller.

Probably any one, on seeing a tiger for the first time, would imagine that it must be a very conspicuous animal in its native jungle. But, as a matter of fact, this is not the case at all. As long as a tiger keeps perfectly still it is most difficult to see him, even if you happen to be looking straight at him; for his bright orange fur, marked with glossy black stripes, looks just like the yellow leaves of the jungle-grass, with streaks of deep shadow

between them. This coloring, of course, helps the tiger in two ways. In the first place, when he is hunting, it enables him to creep up to his victims without being seen; and in the second place, when he is being hunted himself, it often helps him to crawl away without being noticed.

In some parts of India tigers are still extremely common; and of course they do a great deal of mischief. They are very fond of preying upon domesticated cattle, and sometimes, every four or five days for months together, the same tiger will kill and carry away a bullock from the same herd. He generally kills his victims by springing upon them suddenly, seizing their throats with his jaws, and then wrenching their heads backward and sideways, so as to break their necks. Then he will either drag away the carcass into the jungle at once, or he will hide close by, and come back in order to feast upon it when night is beginning to fall.

Of course a tiger cannot devour the whole of a bullock's body at one meal; but at the same time he does not care to leave the remainder for the jackals. So when he has eaten his fill he nearly always finds a sleeping place close by, so that if he should wake up and hear a party of jackals quarreling over the carcass, he can rush out at them and drive **them** away.

MAN-EATERS

But worse by far than the cattle-destroying tigers are the man-eaters. These are sometimes said to be the old and almost toothless animals which can no longer kill a buffalo or a bullock, and therefore take to preying upon human beings instead. But very often quite a young animal becomes a man-eater; and it is said that if a tiger should once taste human blood he will always prefer it afterward to any other food.

A man-eating tiger will often throw a whole district into a state of terror. Day after day he will conceal himself among the thick bushes which border a native road, and lie in wait for solitary passers-by. One day, perhaps, a man will be carried off; the next day, a woman; the day after, a child. No one knows where the animal is hiding; and sometimes he will suc-

ceed in killing fifty or sixty human beings before he is discovered and destroyed.

TIGER-HUNTING

When the natives kill a tiger, they generally do so by driving him into a small clump of jungle, surrounding it with stout netting, and then spearing him through the meshes. Or perhaps they will climb a tree close to the carcass of a bullock which the animal has killed, and shoot him when he comes at dusk to feast upon its remains. But in Oudh the tiger is said to have been formerly destroyed in a very curious way. A number of leaves of the prauss tree, which are large and broad like those of a sycamore, were smeared with a kind of bird-lime, and laid upon the ground in the animal's path. When he came along one of these leaves would stick to his paws, and he would find that he could not shake it off. So he would try to remove it by rubbing it against his face. The only result, of course, would be that his nose and eyes became covered with bird-lime. Meanwhile he had trodden upon other leaves, which he tried to remove in the same way. Before very long his eyelids were stuck down so that he could not open them. Then he would lie down and rub his face upon the ground, covering it with earth, and so making matters worse. By this time he would be thoroughly frightened and begin to howl pitifully, so that when the hunters came running up they found the poor beast an easy prey.

Europeans, however, hunt the tiger by means of elephants, which have to be carefully trained before they can be depended upon to face the furious animal. A number of elephants are generally employed, the hunters riding in howdahs, seats fixed upon their backs, while several hundred natives, perhaps, act as beaters, shouting and yelling, beating drums, firing guns, and making as much din as they possibly can to frighten the animal from its retreat. Sometimes it is so terrified that it slinks out, and falls an easy prey. But now and then it will charge the nearest elephant with the utmost fury, sometimes springing upon it and almost reaching the howdah before it is killed by a well-directed bullet.

The number of tiger cubs in a litter varies from two to five, or even six, although families of more than three are not very common. The little ones do not reach their full size until they are three years old, and during the whole of that time they go about with their parents.

LEOPARDS

Much smaller than either the lion or the tiger, but still a very large and powerful animal, is the leopard, which is sometimes known as the panther. It is spread over almost the whole of Africa, and also over the greater part of Asia, and in many districts is very common.

You can always recognize the leopard by its markings. The ground color of the fur is bright yellow, with just a tinge of red in it, becoming lighter on the flanks, and passing into white on the lower surface of the body. The spots are black, and those on the back and sides are always ring-shaped, enclosing a patch of yellow. Sometimes, however, the whole of the fur is black. But even then you can see the spots, which look something like the markings in watered silk.

Somehow, these black leopards always seem far more savage than the others, and those who have them under their care say that it is quite impossible to tame them.

In spite of its smaller size, the leopard is nearly as powerful as the tiger, and in some ways is an even more formidable foe. It is much more active, for instance, and is more easily roused into rage; while it can climb trees like a cat, and spring down upon a passer-by from among the branches. It does not as a rule attack man, and will always seek safety in flight if it can. But if it is brought to bay it will fight furiously, and nothing will check it but a bullet through the heart or the brain.

When it can do so, the leopard always likes to live near the habitations of man, because there are so many opportunities of springing upon a pony, a sheep, or a goat. At night, too, it will rob the hen-roosts, or make its way into the pens where the calves are kept, and carry one of them off before its presence is even suspected. Dogs, too, fall victims to it in great numbers,

and now and then it succeeds in pouncing upon an unwary monkey. When it kills an animal it does not leave the carcass lying on the ground as the tiger does, and visit it night after night until it is consumed, but carries part of its body up into a tree, and hides them in a kind of larder which it has made among the branches.

Those who have hunted it say that the leopard is a far more difficult animal to kill than the tiger. The reason is that it is so much more wary. A tiger, as it creeps through the jungle, will look most carefully in front of it as it moves along, as well as on either side, but it never seems to think of looking up into the branches of a tree above, to see if an enemy is hiding there. So very often the hunter is able to shoot it before it has the least idea that it is in danger. But a leopard is much more cautious, and never comes back to its lair, or to the remains of its kill, without carefully examining the boughs above as well as the bushes below; so that unless the hunter is well concealed the animal is almost sure to discover him and to crawl silently away before he has got the chance of a shot.

THE OUNCE

This animal looks rather like a leopard with very light-colored fur. But the rosette-like spots are a good deal larger, the fur is very much longer and thicker, and the tail is almost as bushy as that of a Persian cat. The reason why the fur is so thick is that the ounce lives in very cold countries. It is found high up in the mountains of Central Asia, ascending during the summer to a height of perhaps eighteen thousand feet—a good deal higher than the summit of Mont Blanc—and coming down to the lower levels in winter. In other words, it is hardly ever seen below the snow-line, and is often known as the snow-leopard. So it wants good thick, warm fur. We do not know very much about its habits, for it is a very difficult animal to watch in a state of nature. Very few people ever see it. But it seems to prey chiefly upon wild goats, wild sheep, and those odd little burrowing animals that we call marmots, and also upon domesticated sheep and cattle which are sent up to graze on

the higher slopes of the mountains. It is said never to venture to attack man.

THE JAGUAR

Still more like a leopard is the jaguar, which lives in Central and South America. But you can tell it at once by looking at the rosette-like marks on its body, most of which have either one or two small patches of dark brown fur in the middle. It also has three or four bold black streaks across its breast, which are never seen in the leopard. And its tail is ever so much shorter, the tip scarcely reaching to the ground when the animal is standing upright.

The jaguar is perhaps even a better climber than the leopard, and seems far more at its ease among the branches than on the ground. Indeed, there are some parts of the great swampy forests of Brazil in which the animal is said never to descend to the ground at all, but to spend its whole life in the trees which stand so close side by side that it can easily spring from one to another. You wonder, perhaps, what it feeds upon. Why, upon monkeys, and very active indeed it has to be if it wishes to catch them. But then, when a band of monkeys discover a jaguar, they are never able to resist the temptation of getting as close to him as they dare, and chattering and screaming as loudly as they can, just to annoy him. Isn't that exactly like monkeys? But sometimes they venture a little *too* close, and then with a sudden spring he seizes the nearest of his impudent tormentors and carries it shrieking away.

Birds, too, are often caught by the jaguar, who pounces upon them as they are roosting upon a branch. But he is not at all particular as to what he eats, and sometimes he will leave the trees altogether, and go hunting in the reed-beds by the riverside for capybaras, which we will describe farther on. He is very fond of these animals, for they are so slow in their movements that they cannot run away, so badly provided with natural weapons that they cannot fight, and so fat and delicate that they afford most excellent eating.

Then, just for a change, perhaps, he will stroll down to the

sea-shore, and look for a good big turtle. When he sees one which is generally a female on her way back to the water after laying her eggs in the sand—he seizes it suddenly with his fore paws, and turns it over on its back, so that it cannot possibly escape. Then, perhaps, if he is not very hungry, he leaves it for a little while. But soon he returns, and manages to scoop out all the flesh of the animal from between the shells by means of his long hooked talons, thrusting in his paw over and over again, till scarcely the smallest particle is left remaining.

Very likely, too, he will find the spot where the turtle had laid her eggs, dig them up, and devour them as well. Sometimes he will crouch on the bank of a stream, quite close to the water, and hook out the fish that pass by with his claws. And when he is very hungry indeed he will eat lizards and even insects.

Like the ounce, however, the jaguar seldom or never ventures to attack a human being, although he will fight savagely if he is driven to bay. But he will often spring upon horses and cattle, and in such cases he nearly always kills them by seizing their heads between his front paws, and giving a sudden wrench sideways and upward so as to break their necks.

Like most of the cats, the jaguar has a fondness for scratching the trunks of trees, and sometimes a tree may be found with gashes in its bark an inch deep and more than a yard long.

THE PUMA, OR COUGAR

Next to the jaguar, the puma is the largest of the American cats, a full-grown male being sometimes as much as eight feet in total length, of which about three feet is taken up by the tail. In color it is tawny brown, becoming lighter on the lower surface, and without any spots at all. But the odd thing is that its young are marked all over with large blotches of blackish brown, while their tails are ringed with black like that of the tiger. And these markings do not disappear until they are more than six months old.

The puma is found in almost all parts of the American continent, from British Columbia in the north to Patagonia in the south, and it is even said to have been seen in Tierra del Fuego.

It spends some part of its life in the trees, being almost as good a climber as the jaguar. But it almost always hunts upon the ground, trying to creep stealthily up to its victim, and to spring upon it before its presence is even suspected.

It scarcely ever ventures to attack a man, but will often follow him for a long distance as though waiting an opportunity to pounce upon him unawares. But if he suddenly turns and faces the animal, it will always slink away, even if he is quite unarmed. Sometimes, too, it will allow itself to be killed without attempting to defend itself at all. So hunters have a rather poor opinion of its courage. The farmers, however, have very good reason for dreading the animal, for it is a terrible enemy to sheep, and has been known to kill as many as fifty in a single night. And it will also leap suddenly upon horses and cattle and break their necks, just as the jaguar does.

Although in some ways it is such a cowardly creature, the puma will often fight the jaguar itself. Of course it is the weaker animal of the two, but it is so exceedingly quick in its movements, and makes such excellent use of its teeth and talons, that in many cases it gets the best of the battle. Sometimes, when a jaguar is killed by a hunter, its back is found to be deeply scored all over by the claws of a puma.

In many parts of North America the puma is known as the panther, or "painter," also as the mountain lion, and it has other names besides.

THE CLOUDED LEOPARD

There is still one more of the larger cats which we must not pass by without mention, and that is the clouded leopard, or clouded tiger, which is found in the southeastern parts of Asia, and in the larger islands of the Malay Archipelago. In size it is about as big as a small leopard, and its yellow brown fur is marked with stripes like those of the tiger, spots like those of the leopard, rosettes like those of the jaguar, and blotches like those of the ocelots, while its tail is adorned with rings of glossy black. So, you see, it is a very handsome animal.

We do not know very much about its habits, but it seems to

live almost entirely in the trees, and to prey chiefly upon birds, while those who have caught and tamed it say that it is very gentle and playful. The Malays call it the rimau-dahan, or "tree-tiger"; and there is a smaller variety, found in the same localities, which is generally known as the marbled cat.

CHAPTER VII

THE SMALLER CATS

THE smaller members of the cat tribe include many interesting animals of which our readers, if not already informed concerning them, will be glad to learn something.

THE SERVAL

Unfortunately, although this is quite a common animal in many parts of Africa, we know very little about its habits. But it appears to prey chiefly upon the smaller antelopes, creeping silently up to them as they are grazing, and springing upon them so suddenly that they never know that they are in danger until they are struck down.

In South Africa, where it is a good deal more numerous than it is in the northern parts of the continent, the Dutch call the serval the *bosch-katte*, or "bush-cat," because it looks like a rather big cat, and lives in the thick bushy parts of the veldt. It is a pretty animal, and would be prettier still if its short, stumpy tail were a little longer, for its fur is bright golden yellow, marked with dark spots, some of which run into one another, and so form stripes. Underneath the body the fur is nearly white, while the ears are jet-black, with a broad white band running across them. In length the animal measures about three feet, ten inches of which are taken up by the tail; and it stands about eighteen inches in height.

THE OCELOT

This is one of the handsomest of all the cats. It is found in almost all parts of tropical America. But it is not a very easy animal to describe, because it varies so much in color that until a few years ago naturalists thought there were several different

kinds of ocelots, to all of which they gave separate names. As a rule, however, the ground color of the fur is either brownish yellow or reddish gray, while the back and sides are marked with rows of streaks and spots and blotches, which sometimes run into one another in such a way as to look almost like stripes. The length of the animal is about four feet, of which about fifteen inches is occupied by the tail, and it stands from sixteen to eighteen inches in height.

The ocelot is found only in forest districts, and is an excellent climber, spending most of its life in the trees. It feeds chiefly upon birds, hiding among the thick foliage until they settle within reach, and then knocking them over with its ready paw. Or it will spring down upon them as they alight on the ground below. It seems to like the head of a bird best of all, and generally eats that first; and very often it will pluck its victim most carefully before proceeding to devour it.

The animal called the margay is really a kind of small ocelot, and it is sometimes known as the tiger-cat.

THE EGYPTIAN CAT

In this we have a most interesting animal, not only because it seems certain that it is the ancestor of the cats we keep now as pets, but also because in days of old the people of Egypt used to venerate it, just as they also did the Arabian baboon. In every way they treated it with the greatest possible honor. Indeed, to kill a cat, in those days, was a far more serious offence than to kill a man, and if the offender was discovered he was certainly made to pay the penalty with his life. And when the animal died its body was carefully embalmed and wrapped in spices, and was then solemnly buried in the tombs of the kings.

If you ever go to the Metropolitan Museum of Art in New York, or to the Boston Museum, you may see the mummied remains of some of the very cats which were venerated by the people of Egypt five thousand years ago.

In the British Museum is an old painting which is as interesting, although in a different way. For it shows us that,

while the ancient Egyptians held the cat in such high honor, they expected it to make itself useful in return. The picture represents a hunter and his family going out on an expedition in search of water-birds, and from it we learn that they would embark in a boat with several decoy birds, together with a carefully trained cat. They would then push off into the great beds of tall reeds which fringed the sides of the river, and sit in the boat while the cat went and caught birds for them, which were attracted within reach by the decoys. In a picture we have seen, the cat is represented with one bird in her mouth, another in her fore paws, and a third between her hind paws; so that if she got all three back to the boat, she must have been a very clever cat.

This animal is sometimes known as the Caffre cat, and it is found wild in almost all parts of Africa, and also in Syria and Arabia. In size it is about as big as a rather large domestic cat, and in color is generally yellowish gray, with a few faint stripes across the back and several darker ones on the hind quarters, while the tail is marked with black rings and always has a black tip.

THE WILDCAT

The true wildcat is a European animal. In the United States, what is commonly called a wildcat is really a species of lynx—the bay lynx—often called bobcat. It is found in nearly all the States east of the Mississippi River that have large forests.

If you were to see a real wildcat in captivity, you would most likely think that it looked a very gentle creature. But in reality it is one of the fiercest and most savage of all living animals, and no matter how kindly it is treated it never seems to become tame.

True wildcats are nearly always found in thickets in mountain districts which are hardly ever trodden by the foot of man. They mostly live either in hollow trees, or in crevices among the rocks, where they bring up their litters of little ones. They keep their kittens in very good order. We have heard of a wildcat which was kept in a large otter's cage, with a pool of water in the



SOME FIERCE CATS.

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|-----------------------|----------------------------|
| 1. Mexican Ocelot. | |
| 2. Young Leopard-cat. | 3. Himalayan Snow Leopard. |
| 4. Saharan Serval. | 5. American Jaguar. |

middle; and there she brought up three kittens. One day she heard a strange footstep approaching. Now she could not bear strangers, and would never allow them to look at her little ones; so she jumped into the sleeping-compartment, and called to her kittens to come in after her. Two of them obeyed; the third preferred to stay outside. So out she jumped, soused it three times in the water, just to teach it to be more obedient in future, and then carried it off by the scruff of its neck.

A full-grown wildcat is about twenty-eight inches long without the tail, which is much shorter and more stumpy than that of the domestic cat. The thick soft fur is gray in color, brindled with black.

Another kind of wildcat is found in the northern parts of Africa, and also in Persia and India. Sometimes it is called the jungle-cat, and sometimes the chaus. It is rather bigger than an ordinary cat, and is sandy gray or grayish brown in color, with just a few darker streaks across the legs. It lives, as a rule, among long grass and reeds, and in corn-fields, coming out to hunt only by night; so very few people ever see it in a wild state, and we do not know very much about its habits. But it must be rather a formidable animal to meet, for a writer tells us that a jungle-cat which he kept for some years as a pet was more than a match for two powerful English bull-terriers, which used to attack her day after day, but always got the worst of the battle.

THE CARACAL

You may see this animal at some zoo; and if you go to look at it your first idea will most likely be that it is very bad-tempered. For as soon as you come near its cage it is almost sure to throw back its ears, show its teeth, and spit and hiss and snarl at you, and to look as if it would fly at you in a moment if only the bars were not in its way. And so no doubt it would, for it is one of the most savage of all the cats, and cannot be tamed without very great difficulty, unless it is caught while very young.

The name caracal signifies black-eared, and has been given

to the animal because its ears are jet-black in color. They also have a long tuft of dark hairs at the tip. The head, body, and legs are bright reddish brown. But some caracals are a good deal lighter than others, and now and then the lower parts of the body are marked with dull reddish spots. The height of the animal is about eighteen inches at the shoulder, and the length of the body and tail together is from three to four feet.

Caracals are found in India and Arabia, and also in most parts of Africa. They live among bushes and long grass, as a rule, and prey upon the smaller deer and antelopes and also upon birds, which they are said sometimes to capture even on the wing, springing into the air and seizing them between their fore paws as they fly past.

THE LYNX

This odd-looking creature appears somewhat like a stoutly built caracal. But the ears are gray instead of black, the tufts of hair upon them are a good deal longer, and the fur of the body is gray, generally marked with a number of darker spots. Its curious appearance, however, is due to the fact that it has an enormous pair of very bushy whiskers, which hang down far below the chin.

Not so very long ago the lynx was found commonly in many parts of Europe, and it is still tolerably plentiful in Norway, Sweden, and the northern parts of Russia, as well as in Northern Asia. But it is very much persecuted by the hunters, for two reasons. In the first place, it is a very destructive creature. A couple of lynxes have been known to kill six sheep between them in a single night. In the second place, its fur is so thick, so soft, and so warm that its skin sells for a good deal of money. So a great many lynxes are shot or trapped every year, and before very long the animal will most likely disappear from Europe altogether.

No doubt you have sometimes heard the expression "lynx-eyed" used of somebody whose sight is unusually good. And certainly the lynx is very sharp-sighted. In days of old it was

actually thought that the animal could see right through a solid wall as easily as we can through a pane of glass!

The lynx is a good climber, and spends a great part of its life in the trees, often lurking among the branches in order to spring down upon an unsuspecting victim as it passes below. But it mostly makes its lair among rocks, just as the wildcat does. There it brings up its two or three little ones, which are playful little creatures, but very bad-tempered if any one interferes with them. However, they are easily tamed if they are captured while quite small, and will follow their master about just like a dog.

Another kind of lynx, called the pardine lynx, inhabits the south of Europe, from Spain as far as Turkey.

Lynxes are also found in Canada; but it is not quite certain whether these belong to a different species or not. At any rate, they are rather smaller than those which live in Europe and Asia, and their tails are hardly ever more than five inches long. They live in the deepest parts of the forests, and in thick bushy districts, so that they are not very often seen; and they prey upon hares and other small animals, and also upon such birds as grouse and partridges.

When one of these lynxes is running through long grass it looks very odd; for it travels by means of a series of leaps, all four of its feet coming to the ground together.

We have already mentioned the bay lynx of the United States, which in size is equal to the Canada lynx.

THE CHETAH

Last among the cats comes the very curious chetah, or hunting-leopard, which is found both in Africa and in India.

In some ways, however, it is much more like a dog than a cat. Its head is quite small and round, its body is very slender, and its legs are much longer in proportion to its size than they are in any other member of the family. But, more remarkable still, the claws are not entirely drawn back into their sheaths while not in use, as they are in all the true cats, but partly project, so that the points are worn away by constantly rubbing against the

ground. So we may consider the chetah as partly a cat and partly a dog—a connecting link joining the two families together.

If it were not for the length of its limbs, however, the chetah might very well be mistaken for a leopard, for its head and body are colored and marked in much the same way. But the spots are solid, so to speak, and not ring-like as they are in the leopard. The animal stands from thirty to thirty-three inches in height at the shoulders and the body and tail together are about seven feet long.

The chetah does not capture its prey as other cats do. Lions, tigers, and leopards, for example, always try to creep up quite close to their victims, so that they may be able to pounce upon them at a single spring. But the chetah only creeps up to within about two hundred yards, and then runs them down in fair chase. It is exceedingly swift of foot, being able easily to outrun a greyhound, so that when once it starts in pursuit its victim has but little chance of escape. Indeed, a chetah has actually been seen to put up a blackbuck two hundred yards away, and to run it down within a quarter of a mile.

Just fancy being able to run nearly twice as fast as an antelope!

In India the chetah is often caught and tamed, in order that it may catch game for its master. It is always taken out to the hunting-ground in a light cart, drawn by a pair of bullocks, and its eyes are covered with a kind of hood. When a deer or an antelope is sighted, this hood is taken off, and the chetah is released from its chain. No sooner does it catch sight of its quarry than it creeps quietly toward it until it is within distance, and then starts off in pursuit like an arrow shot from a bow. The hunters ride quietly after it, and before they have gone very far they are sure to find the chetah with its victim pinned upon the ground. Then the throat of the animal is cut, and some of the blood is given to the chetah to drink, after which it is again blindfolded and is led back to the cart.

When the natives want to catch a chetah or two, in order to train them for hunting, they do so in rather a curious way. Although these animals cannot climb trees, because of the

manner in which their claws are made, there are certain trees to which they are very fond of resorting, in order to sharpen their talons upon the bark. So the natives make a number of nooses of raw hide, and arrange them on the ground all round one of these trees: and when they visit them next day they are almost sure to find that two or three chetahs have been snared.

It is needless to say that this beautiful and interesting animal is very easily tamed. If it is kindly treated it will rub its great round head against one, put up its tail, and purr loudly just like a big cat.

CHAPTER VIII

THE CIVETS, THE AARD-WOLF, AND THE HYENAS

BETWEEN the great tribes of the dogs and the cats come three small but rather important families, one of which contains the civets, while the aard-wolf belongs to the second, and the hyenas to the third. We must tell you a little about each.

CIVETS

First of all, then, come the civets; and first among the civets is the fossa, which is found in Madagascar.

This is a very curious animal. It is about five feet long from the end of its snout to the tip of its tail, and has a body shaped much like that of a weasel. Its fur is pale reddish brown in color, and reminds one of the coat of a dachshund dog. But the oddest thing about the fossa is its way of walking. Some animals walk on the tips of their toes, like the cats and the dogs. We call these digitigrades. Others plant their feet flat upon the ground, like the bears. We call these plantigrades. But the fossa does neither, for its feet have half-soles only, the front part being quite bare underneath, while the hind part is covered with hair. And as it walks the animal places the bare part of its feet upon the ground, while the hind part is lifted up; so that it is half a digitigrade and half a plantigrade.

Then it has claws just like those of a cat, which are drawn back into sheaths while not in use, so that their sharp points may not be worn down by rubbing against the ground. No doubt this is the reason why the animal is able to climb so well. If you go to look at the fossa in a zoo you will be quite surprised at its activity. In its double cage, with one compartment above the other, and two or three stout branches on which it can take exercise, it goes running up and down from one to the other,

and backward and forward from the branches to the walls, and from the walls to the branches, with such wonderful swiftness that it is really not at all easy to follow its movements.

But don't be tempted to stroke the animal, if it happens to be lying quietly near the bars, for although it looks very gentle it is in reality a most savage creature, and has hardly ever been tamed. And partly for this reason, and partly because it only comes out to hunt for prey by night, we know very little about its habits.

The true civets have much stouter bodies than the fossa. Their heads are long and narrow, with the muzzle drawn out almost into a point, their legs are quite short, and along the back runs a crest of stiff hairs, which can be raised and lowered at will, just like the spines of the hedgehog.

CIVET PERFUME

Six different kinds of civets are known, five of them being found in Asia, and one in Africa, and they are chiefly remarkable for producing a most powerful perfume. This perfume is obtained in a very curious way. It is secreted in a kind of double pouch under the body, close to the root of the tail, and as it is continually being formed, the animal is much too valuable to be killed in order that its pouch may be emptied. At the same time, its teeth and claws are so sharp and strong, and it knows so well how to use them, that it would be a most dangerous creature to handle. So when the perfume has to be taken, the animal is forced into a long and very narrow cage, in which it is held so close a prisoner that it can neither scratch nor bite. Then the contents of the pouch are scraped out by means of a long, slender spoon, which is passed through a hole under the cage.

Each side of this pouch is about as big as an almond, and the contents are thick and greasy in character, almost like butter. When the animal is at liberty the perfume is dropped from time to time, in lumps about as big as an ordinary hazelnut.

INDIAN CIVET

The best known of these animals is the Indian civet, which is about four feet in length, including the tail. The general color of its fur is dark gray, sometimes with a yellowish tinge, and on the chest, shoulders, and thighs are a number of dark stripes. The crest of hairs along the back is glossy black, and the tail is marked with six black rings and five white ones. It is a solitary animal, and is hardly ever seen during the daytime, which it spends in hiding among bushes, or in long, thick grass, coming out after dark to search for the lizards, frogs, birds, and other small creatures upon which it feeds.

GENETS

The genets may be described as small civets, with narrower bodies, shorter legs, and longer tails, and without the curious pouch for producing perfume.

One of these animals, the common genet, is found in Spain and the south of France, as well as in Southwest Asia, and the northern parts of Africa. It is between three and four feet in total length, and is yellowish gray in color, with blotches of dark brown scattered all over the body. It is a very gentle creature, and is easily tamed, being often kept in houses to destroy rats and mice, just as we keep cats.

The palm-civets live in trees, chiefly in palm-trees, and they are so fond of drinking the sweet juice, or toddy, which the natives collect in small vessels suspended on the trunks, that they are often known as toddy-cats.

One of these animals is very common in many parts of India, where it is in the habit of taking up its abode in the thatched roofs of the native huts. It is often tamed by Europeans, and after roaming about the house all night in search of mice and cockroaches will come up to its master's bedroom, jump up on his bed, snuggle away under his pillow, and there sleep soundly until late in the following day. But if it finds a chance it will get into the poultry-houses and kill some of the fowls, in order

to suck their blood; so that it has to be looked after very carefully.

There are ten or eleven different kinds of these animals, the commonest of which is the Indian palm-civet. It is about as big as a rather big cat, and is brownish gray in color, with very coarse and rather ragged fur. It has an odd way of twisting up its tail into a very tight coil, and for this reason is sometimes known by the name of paradoxure, a word which signifies queer-tailed.

THE BINTURONG

The binturong, or bear-cat, as it is often called, may be recognized at once by the long tufts of black hair upon its ears. Its fur, too, is entirely black, without any gloss except upon the head, which is gray, and its tail is very long and bushy, and is prehensile at the tip, like that of a spider-monkey. When the animal is climbing it makes a great deal of use of this organ, seldom moving unless it is tightly coiled around a branch. But it seems hardly ever to hang from a bough by its tail alone, as the spider-monkeys so often do.

The binturong is a native of Assam, Siam, and some of the larger islands in the Malay Archipelago. It is not at all an uncommon animal, but is seldom seen, for it not only lives in the thickest and darkest parts of the forests, which are scarcely ever trodden by the foot of man, but spends the whole of the day fast asleep in some snug retreat, with its head completely buried beneath its big bushy tail. And even if it is found and disturbed it only gives an angry snarl and shows its teeth, and then goes to sleep again.

MONGOOSES

Of course you have heard of the mongooses. They look somewhat like weasels with very long tails, which are thickly covered with hair. The head is pointed, with a rather sharp nose, the ears are small and rounded, the legs are very short, and the claws cannot be drawn back into sheaths, so that they are

always projecting like those of a dog. The general color of the body is either brownish or reddish gray. But the fur has a peculiar speckled appearance, which is due to the fact that all the longer hairs are marked with alternate rings of black and white, like those upon a surveyor's measuring-pole.

At least sixteen kinds of mongooses are found in different parts of the world, but we shall only be able to tell you about two.

The first of these is the Indian mongoose, which is common in almost all parts of the great country from which it takes its name. And it is one of the most useful of all animals, for although it will feed upon mice, small birds and their eggs, lizards, and even upon insects and fruit when it is really hungry, there is nothing of which it is so fond as a snake.

Now snakes are more plentiful in India, perhaps, than in any other country in the world. Many of them are terribly poisonous, and kill at least twenty thousand people every year; so that an animal which destroys them is very useful. Many people keep tame mongooses in their houses just as we keep cats, knowing that if a snake should find its way indoors they are sure to find it and kill it.

When a mongoose attacks a snake it dances about in front of the reptile, and pretends to be about to spring upon it, until the snake strikes. Then, like lightning, it leaps over the snake's head, or underneath its open jaws, or round to one side, and gives it a sharp bite just at the back of its neck. This renders the snake quite harmless, paralyzing it so that it cannot use its fangs. Then the mongoose crunches up its head, eats a little of the body also if it is very hungry, and goes off to look for another.

Rats, too, are killed in great numbers by the mongoose. So in the year 1871, when these animals swarmed in some of the West Indian Islands to such an extent that it was feared that the sugar-cane plantations would be wholly destroyed by them, nine mongooses were set free in Jamaica. Very soon they began to multiply, and the rats began to decrease, till in about two years' time the mischievous little animals were almost entirely destroyed. So mongooses were turned down in other islands,

with equally satisfactory results. Unfortunately, however, the mongooses soon found out that fowls and chickens were even nicer than rats, and began to visit the hen-roosts at night. Then they took to killing young lambs, and even small pigs, while they also did a great deal of damage to mangoes and yams.

So now the planters had to turn their attention to destroying mongooses, and on one estate alone more than fourteen hundred were trapped in about two months.

The Egyptian mongoose is a rather larger animal, being about three feet in length from the head to the tip of the tail. Like its Indian relation, it preys upon snakes; but it also feeds very largely upon crocodile's eggs, which it digs out of the sand on the banks of the rivers. For this reason it was venerated by the ancient Egyptians, who used to treat it with the greatest reverence while it lived, and to embalm its body and bury it in the tombs of the kings when it died, just as they did with the cat and the sacred baboon.

MEERKATS

The last of the civet-like animals about which we can tell you is the meerkat, sometimes known as the suricate. It is found in South Africa, and is a small, slender-bodied animal of a light grizzled gray color, with a number of black stripes running across its back, while the ears are black, and the tail is yellowish with a black tip.

Meerkats live in large colonies, almost like rabbits, each animal scratching out for itself a deep hole in the ground. If you were to drive across the South African veldt, you would very likely come across one of these curious meerkat warrens, and would see several hundred of the little animals sitting upright on their hind legs with their front paws hanging down, just like so many small dogs "begging." Until you came quite close they would remain quietly watching you. But the moment that you stopped and attempted to seize one of them there would be a sudden whisk of hundreds of tails, and down they would all pop into their burrows as if by magic.

As they are gentle creatures, and very clean in their

habits, meerkats are often kept as pets, and in many parts of Cape Colony there is scarcely a single house without them. You would think that the dogs would be very jealous of them, wouldn't you, and that they would be very much afraid of the dogs? But, strange to say, the two are nearly always the best of friends, and may often be seen trotting about after their master together.

THE AARD-WOLF

This is such a very odd animal that it has been placed in a family all by itself, though there can be no doubt that it is related to the civets on the one side and to the hyenas on the other. In size it is about as big as a fox, but with very much longer legs; and in general appearance it certainly resembles a half-grown striped hyena. But then its skull and teeth are not at all like those of a hyena; they are like those of a very big mongoose. So the aard-wolf evidently forms a connecting link between the two creatures.

The name aard-wolf means earth-wolf, and has been given to this animal because the Dutch people in South Africa thought that it really was a kind of wolf, and because it lives in deep burrows which it digs in the ground. Strange to say, although each aard-wolf digs its own burrow, several of these tunnels often unite in one large central chamber—a common sitting-room, as it were—which is used by all the animals alike. But each always goes in and out by its own front door.

During the daytime the aard-wolf is nearly always fast asleep underground, so that it is hardly ever seen except by those who go out to hunt it. But it is not often hunted, being so timid and cowardly that when it is turned out of its burrow its only idea is to run away as fast as it possibly can, so that it affords very poor sport.

This animal is not a creature of prey, but feeds chiefly on carrion. But it is rather fond of insects, and will sometimes break a hole in the side of a termites' nest and lick up the inmates by thousands as they come hurrying up to repair the breach in the walls.

HYENAS

These are not very pleasant-looking animals, for their sloping hind quarters give them a very slinking and cowardly appearance. In their habits, too, they are disgusting. Nevertheless they are most useful creatures in the countries in which they live; for they belong to that vast group of animals which we may call "nature's dustmen," because their great work in life is to clear away the rubbish from the world. There are millions upon millions of these natural scavengers, and some of them have to clear away carrion, some to clear away skins, and some to clear away decaying vegetable matter. But the principal duty of the hyenas is to clear away bones, and very thoroughly they do it.

Their jaws and teeth are immensely strong. A hyena will seize the thigh-bone of an ox, and crush it up into splinters as easily as a dog will crush a chicken-bone. And when a lion or a tiger kills a victim, he always leaves a great part of the carcass lying on the ground. Some of it he has no time to eat because the jackals come and steal it while he is fast asleep after the big meal which he always takes as soon as he has killed his victim. Some of it neither he nor the jackals can eat because their teeth are not nearly strong enough to crush the larger bones. So they have to leave these for the hyenas, which come up in numbers to the kill, and quarrel and fight over it, until nothing even of the skeleton remains.

Although the hyena is a much stronger animal than the aard wolf, it is quite as cowardly, and will hardly ever show fight, even when it is driven to bay. The Arab hunters despise it for its want of courage, and if they find it hiding in a burrow will never condescend to kill it themselves. Neither will they use any weapon against it. They just fling a handful of wet mud into its face, drag it out by its hind feet, and hand it over to be stoned to death by the women. But sometimes, after all, it contrives to escape, for it is so cunning that it will pretend to be dead when it is not really injured, allowing itself to be pulled about, or even to be severely beaten, without moving a limb.

Then suddenly, when the attention of its captors is taken off for a moment, it will jump up and run away.

Perhaps you wonder why they should want to kill the hyena if it is such a useful creature and never attacks human beings. The reason is that it is fond of prowling about the outskirts of villages in order to prey upon the cattle. It is much too cowardly to attack them openly, and always tries to frighten them and make them run away, so that it can leap upon them from behind. It generally does this by creeping as close to them as it can, and then springing up suddenly just under their eyes. But if they stand and face it, instead of running away, it just looks at them for a few moments and then slinks off without attempting to touch them.

THE STRIPED HYENA

Three different kinds of these animals are known, the commonest being the striped hyena, which is found in India, Syria, Persia, Arabia, and Northern Africa. It is about as big as a collie dog, and is brownish gray in color, with a number of black stripes running across the body and round the legs. The ears are long and pointed, the tail is big and bushy, and a kind of mane of long hairs runs down the neck and along the middle of the back.

In some parts of Africa these animals roam about by night in large packs, entering the native villages, and searching the streets for the offal which has been thrown out from the huts. And more than once, when very hungry, they have been known to enter a house and carry off a sleeping man.

Sometimes they will set a kind of snare for a dog. One hyena will lie in wait behind a bush, while another will run boldly up to within two or three hundred yards of the village and utter a series of loud howls. A dog is almost sure to hear him and to rush out in pursuit. Then the hyena, pretending to be dreadfully frightened, runs away past the bush where his companion is hiding, and the dog is pounced upon and killed almost before he realizes that he has two enemies to deal with instead of only one.

THE BROWN HYENA

This kind of hyena, found in South Africa, is not nearly so numerous as that just described. It is about the same size as the striped hyena, but may be recognized at once by the great length of its mane, which hangs down on each side below the body. In fact, the animal looks just as if it were wearing a mantle of thick, shaggy fur. It lives chiefly in rocky ground, on the lower slopes of the mountains, but is fond of visiting the sea-shore by night, and prowling about in search of the dead bodies of fishes and other creatures flung up by the waves.

THE SPOTTED HYENA

The tiger-wolf, as the spotted hyena is also called, is much more dangerous than the other hyenas. It is a larger and more powerful animal than either of its relations, and is not near so cowardly. It will enter a sheepfold, or cattle-pen, for instance, under cover of darkness, and boldly attack and carry off one of the animals. But even an unarmed man need not be afraid of it, for though it will come quite close, and will follow him for a long distance, it will never venture to spring upon him.

This animal is often known as the laughing hyena, because of the extraordinary sounds it utters when very much excited. These sounds are not in the least like a yell or a howl, but resemble a peal of strange, unearthly laughter, and while they are being uttered the hyena dances about on its hind legs, nods its head up and down, runs to and fro, and twists itself into all sorts of singular positions, just as though it had suddenly gone mad. Travelers tell us that sometimes for nights together sleep is rendered impossible by the hideous outcry of these creatures, which surround the camp as soon as darkness sets in, and never cease from their horrible din till sunrise.

The spotted hyena is found throughout Southern Africa, and may be known from the other two species by its larger size, and also by the dark-brown spots with which the body and the limbs are marked.

CHAPTER IX

THE DOG TRIBE

NEXT in order comes the great tribe of the dogs, which includes altogether about forty different animals. We are not speaking of domestic dogs, for we have not space in which to tell you about those. Indeed, if we were to say all that might be said about them, they would want a very big book all to themselves; and fortunately there are many good books about domestic dogs that readers who desire them can easily get. But besides the tame dogs there are two or three wild dogs in the dog tribe, several wolves, several jackals, and several foxes; and many of them are very interesting creatures.

THE DHOLE

First of all, there is a dog which is known by three different names. Sometimes it is called the dhole, sometimes the kholsun, and sometimes the buansuah. It lives in India, but it is not very often seen, for it keeps to the thickest parts of the jungle, and never ventures near the habitations of man. Yet it is by no means a cowardly animal, like the hyenas and the aard-wolf. On the contrary, it is extremely courageous, and does not seem to know what fear is, for it will even attack the tiger itself, and more than that, will kill it.

Of course the tiger is by far the stronger and more formidable animal of the two, and if he only had one dhole to reckon with, there would be no doubt as to the issue of the combat. But the dhole always hunts in packs. Sometimes there are eight or ten animals in one of these packs; sometimes there are fifteen; sometimes there are as many as twenty, or even thirty. And so fierce are they, and so determined, and so persevering, that it is said that when they once put up an animal—that is, start it



A WOLFISH GROUP.

- | | | |
|----------------------------|---------------------|-------------------------------|
| 1. Coyote. | 2. Red Fox. | 3. Hyena Dog, or Hunting Dog. |
| 4. Tasmanian Pouched Wolf. | 5. Tasmanian Devil. | 6. Gray Wolf. |

from cover—no matter whether it be large or small, they never fail to kill it.

The deer, of course, are swifter than they are. But then the deer become tired much sooner than the dholes; and while they are resting their pursuers catch up with them. The tiger is much more powerful, and has his talons and fangs to fight with. But while he is killing one of his foes three or four more are leaping upon him; and even if he should succeed in killing half the pack the rest will still go on fighting as savagely as ever. They do not dread the horns of the buffalo, or the tusks of the wild boar. In fact, they dread nothing, and no animals are so feared in the jungle.

When the pack are running, they never bark, or yelp or bay, as almost all domesticated dogs do. For the most part they are silent, the only sound which they utter being a low whimper. In color the dhole is a rich bay, which becomes rather darker upon the ears, the muzzle, and the tip of the tail.

THE DINGO

This is the only member of the dog tribe found in Australia, and many naturalists think that it is not really a native of that continent, but was brought there a very long time ago from some other country. But as the dingo is not now found in any other part of the world, it is quite impossible to say whether this is actually the case or not. It is a very fine-looking animal, about as big as a large sheep-dog, with a reddish-brown coat, pointed, upright ears, and a bushy tail. And if you were to see it you would most likely think that it must be a very gentle animal. We have already seen, however, that there are several creatures which look very gentle, but are in reality most savage and ferocious, and though the dingo is not quite so fierce as the fossa or the wildcat, its appearance is not at all in keeping with its character, for it is very bad-tempered and hard to tame, and is always liable to fits of rage.

In many ways the dingo is not unlike the dhole. It lives in packs, for instance, which scour the country in search of prey. These packs are always led by one of the strongest and most

experienced animals, which has won its position by fighting and overcoming all the rest; and when the leader begins to grow old and feeble, a younger and stronger animal takes his place by overcoming him in the same way. In some strange manner, these packs divide up the country among themselves. Each pack has its own district allotted to it, over which it may roam at will, while it is never permitted to hunt outside its own borders. Wouldn't it be interesting to know how these districts are marked out, and how the animals arrange what part of the country shall be allotted to each pack?

When the first white colonists settled down in Tasmania, they found these packs of dingoes terribly troublesome, for they would visit the folds night after night and carry off the sheep and lambs in numbers. Watchers were employed to shoot them, traps were set for them, huge bonfires were lighted to keep them away; but all to no purpose. One colony lost twelve hundred sheep from their ravages in less than three months; another lost seven hundred. At last the settlers banded themselves together in a war against the dingoes, and by hanging pieces of poisoned meat to the branches of trees, about a foot from the ground, they succeeded in greatly reducing their numbers, so that now they are comparatively scarce.

A dingo which was kept at the London Zoo many years ago used to sit outside his kennel and bay at the moon so loudly that his dismal howling could be heard all over the Regent's Park.

THE CRAB-EATING DOG

Two or three kinds of wild dog are also found in South America; but of these we can only mention the crab-eating dog which is chiefly found in the forests of Guiana, Demerara, and Brazil.

This animal owes its name to its great fondness for crabs. Even domestic dogs will often eat these creatures. "I once had a black-and-tan terrier, called 'Jock,' says a writer, "whose greatest delight was to be taken for a walk along the sea-shore, so that he might hunt for crabs. Whenever he found one he would fling it up into the air half a dozen times or so, until it

was perfectly dazed. Then holding it down with one paw, he would twist off the great claws so that it could not nip him; and finally he would crunch up its body and lick out pieces of flesh from the shell. Now and then, however, he would get a pinch and I would see him dancing about on his hind legs with a crab hanging to his lip, howling pitifully for me to come and set him free."

Whether the crab-eating dog gets nipped in the same way, sometimes, we cannot tell you. Most likely he does; at any rate he spends a great deal of his time in hunting for crabs on the shore. But he also feeds on small animals and birds, and it is said that sometimes he hunts in packs, like the dingo and the dhole, which even run down and kill the swift-footed deer.

WOLVES

Of wolves—which are really only large and very savage wild dogs—there are several different kinds.

First of all, of course, there is the common wolf of Europe. We have all read accounts of its ferocity, and of the way in which it sometimes pursues travelers through the Russian forests during the depths of winter. In days of old it was plentiful in England, while the last wild wolf in Scotland was not killed until the middle of the eighteenth century.

During the spring, summer, and autumn the wolf is mostly found singly, or at any rate only in pairs. But when the ground is covered with snow, and food becomes scarce, the hungry animals gather together in packs, which scour the forest in all directions and kill every living creature which they meet. In the year 1875 no less than 161 human beings fell victims to them in Russia, while the mischief which they do in the farmyards and sheepfolds is very great. In Livonia alone, for instance, during a single year, 15,182 sheep, 1,807 cattle, 1,841 horses, 3,270 goats, 4,190 pigs, 703 dogs, and 1,873 geese and fowls were destroyed by wolves.

In some parts of France, too, these animals are still not uncommon, although a reward of one hundred francs is paid for every adult wolf that is killed, and thirty francs for each cub.

And they are also found in almost every other country in Europe.

When they are not famished with hunger, wolves are by no means courageous animals, and if we have many tales of their savage ferocity we have quite as many more which bear witness to their cowardice. In Norway, for example, a large tract of country in which wolves had always been only too numerous was suddenly deserted by them; and what do you think was the reason? Simply that a telegraph wire had been put up, which frightened the wolves so much that they left the neighborhood altogether, and never came near it again! And if a hunter kills a deer, and wishes to leave the carcass lying on the ground for a while, and at the same time to protect it from the wolves, all that he has to do is to plant three or four sticks beside it with streamers of white cloth fastened to the tips; for not a wolf will dare to approach the spot as long as these are fluttering in the wind.

When wolves are running they generally utter a series of dismal howls, which are so loud that they can be heard by any one miles away. And even a single wolf can make such an outcry that more than once a traveler, hearing one howl, has imagined that a large pack were in pursuit of him, and has climbed into a tree and spent the whole night among the branches before discovering his mistake.

Wolves usually make their lairs among rocks, or in the trunk of a hollow tree, or among thick bushes. But sometimes they live in holes in the ground, which they seem to dig out for themselves. There are generally from six to ten cubs in a litter, which are born in the spring, and do not leave their parents for at least eight or nine months. Strange to say, the father often seems much fonder of them than the mother, for he will take care of them, and hunt for them, and teach them how to hunt for themselves for weeks after she has left them altogether.

WOLVES IN INDIA

The common wolf is by no means confined to Europe, but is also found in many parts of Asia, and throughout almost the

whole of North America. In India, however, there is another kind of wolf which is rather smaller, and has very much shorter fur. It is seldom seen in large packs, and hardly ever howls as the common wolf does. It is not in the habit, as a rule, of attacking human beings. But now and then two or three of these animals will band together to attack a man, while sometimes they will prowl round the outskirts of a native village, in the hope of being able to carry off some of the smaller children.

These animals have a very clever way, too, of killing deer. Three or four of them will creep quietly up and hide themselves near the spot where the deer are feeding. Then another will come dashing up from the opposite direction, the result, of course, being that when the frightened animals run away they pass close to the very place where their enemies are lying concealed.

COYOTES

On the great plains of North America lives a very handsome wolf called the coyote, or prairie-wolf. It is a good deal smaller than the common wolf, but has much thicker and longer fur, so that it looks bigger than it really is. And a very odd thing about it is that it is differently colored at different seasons of the year, being reddish yellowish brown in summer, and grayish, or even quite gray, in winter. The back is generally darker than the rest of the body, and the tail is rather long and very bushy.

The coyote takes the place of the hyena as a scavenger, but has some of the habits of the fox. It catches birds and jack-rabbits, and feeds on insects, as well as small rodents like prairie-dogs and mice. Its melancholy howls make night hideous to prairie-dwellers. It is the steady foe of young creatures, such as the fawns of deer. The skin of this animal is thick and makes good fur wraps.

Coyotes assemble in packs like jackals. It is not an easy matter to destroy them, for they are so wary that it is almost impossible to approach within gunshot. Often a single coyote will do a great deal of mischief before it can be killed. Poison

kills a great many; but a good fence of wire netting has been found to be the best remedy against these troublesome creatures.

JACKALS

Jackals may be described as half wolves and half foxes. One of these animals, the common jackal, is found in great numbers in the south of Asia, and north of Africa, and the southeastern corner of Europe. Sometimes it is seen singly, sometimes in pairs; but generally it associates in great packs, which go roaming about the country together. In India these packs visit the native villages by night, to carry away any offal which may have been thrown out of the houses. They are "nature's dustmen," you see, like the hyenas. Then they will follow a lion or a tiger about for weeks, in order to feast upon the carcasses of the animals which he kills, after he has eaten his fill. And when twenty or thirty of these ravenous creatures are all struggling and fighting over the body of a deer or an antelope, you can easily imagine that in a short time there is not very much of it left.

The jackal is sometimes called "the lion's provider," but we may say that the lion ought rather to be called "the jackal's provider."

The natives of Africa say that the jackals stand very much in awe of the lion, and seldom dare even to show themselves until he has eaten his fill of his victim's body, and has gone away to sleep. And they also declare that if a jackal comes too near the carcass before the lion has finished his meal, the lion catches him and bites off all his paws in order to teach the rest of the pack better manners.

The howling cry of the jackal is very strange and weird, and the animals call to one another, and answer one another, just as if they were carrying on a conversation. First comes a long, wailing yell; then another, rather higher, then another, a little higher still, and then three short, sharp barks. And so on, over and over again.

When a jackal is caught, it often pretends to be dead, and will be perfectly still for a very long time in the hope of being

able to make its escape when the attention of its captors is taken off. On one occasion one of these animals lay without moving for a whole hour although several times it was picked up and worried by a dog. Then quite suddenly it jumped up and rushed away apparently unhurt.

The common jackal is reddish brown in color, sometimes lighter and sometimes darker, while the tip of the tail is black. But there is another kind of jackal found in South Africa which has the whole upper part of the back black, and the lower part of the body and the inner sides of the limbs nearly white. This animal is called the black-backed jackal, while a third, which has a pale streak running across its flanks, is called the side-striped jackal. In habits the three animals are almost exactly alike.

FOXES

The best-known of the foxes, of course, is the common fox of Great Britain and Western Europe, which is also found in many other parts of the world.

This animal is famous for its cunning, and certainly, in many ways, it is very clever. It has all sorts of tricks, for example, to throw the hounds off its track when it is being hunted. It seems to know perfectly well that it is followed by scent, and sometimes it will suddenly leap to one side so as to break the trail, and then make off in quite a different direction. Sometimes, when it has a sufficient start, it will return on its track for sixty or seventy yards, and then leap aside. Or it will roll in carrion in order to disguise its own peculiar odor. A hunter tells us that he once found a fox's burrow which was very cleverly made. The entrance to it was about twenty feet from the edge of a sand-pit, in the middle of a thick clump of bushes, and there was a "bolt-hole" about half way down the side of the pit. So when the fox was chased he could run into his burrow by the upper entrance, slip out by the lower one, and so make his escape through the pit while the hounds were all gathered round the hole up above.

Very often a fox will climb a tree, sometimes to a great height,

and hide among the branches, and we have heard of a fox which baffled the hounds over and over again in a most ingenious way. He used to run to a certain fence, spring to the top, and then walk along for several hundred yards before leaping down again to the ground. By doing this, of course, he broke the scent most thoroughly, and long before the hounds could find it again he had reached a place of safety.

But although the fox is generally so clever he sometimes does the most stupid things possible. Charles Waterton tells us of a fox which visited a poultry-yard and carried off eight young turkeys. He could not eat them all, of course, so he buried five in the ground, meaning no doubt, to come and fetch them away on the following evening. But apparently he thought that if he buried them entirely he might not be able to find them again. So he carefully left one wing of each bird sticking up above the surface to serve as a guide, and never seemed to reflect that others would be able to see it as well as himself! So the farmer recovered his turkeys, and when Reynard came to look for his supper next night he found that it had disappeared.

The burrow of a fox is sometimes an old rabbit-hole enlarged to a suitable size. But generally the animal scrapes out a burrow for himself, frequently choosing the roots of a large tree as a situation, or a very rocky piece of ground from which it will be very difficult to dig him out. In this burrow four or five little ones are brought up. They are odd-looking creatures, with very snub noses, and if you did not know what they were you would never take them for young foxes.

THE ARCTIC FOX

This animal, more interesting still, perhaps, lives in the ice-bound regions of the far north. There are often several of these to be seen in a zoo, and the first thing that one notices on seeing them is that no two of them are alike. One, perhaps, is reddish brown above and yellowish white beneath. Another is gray all over. A third, very likely, is mottled; while a fourth may be of that curious bluish color which we see in Russian cats.

In fact, in the snowy polar regions a great many of these foxes turn perfectly white in winter. This enables them to creep over the snow without being seen by their victims. Then, when warmer weather comes, and the snow begins to melt, their fur passes back again to its original color.

During the spring and summer the arctic fox feeds on sea-birds and their eggs, and it is said to attract the birds to the place where it is lying in wait by imitating their peculiar cries. But we do not think that that is true. What it feeds upon during the rest of the year is rather doubtful. It cannot catch birds, for they have all flown away farther south. It cannot catch fishes, for the water is covered in by ice several feet in thickness. Most likely it catches numbers of those odd little animals known as lemmings just as winter begins, and stores them away in a kind of larder, where the cold prevents their bodies from decaying.

The arctic fox is a good deal smaller than the common fox, and has ears so short and rounded that they look just as if they had been cropped.

In order to allow it to travel over the slippery ice, the arctic fox has the soles of its feet covered with long stiff hairs, which give it a perfectly firm foothold on the frozen surface.

The arctic fox is not nearly such a clever animal as the common fox, and is very easily trapped. If a hunter follows one, it will certainly run into its hole; but a moment or two later it is almost sure to poke out its head in order to yelp at him, so that he is easily able to shoot it. The consequence is that these animals are destroyed in very great numbers for the sake of their skins, those with bluish fur being especially valuable.

First-class skins of these foxes are, in truth, among the most costly of furs. In view of this, men interested in the fur-trade in Alaska have endeavored to raise them in captivity, so as to obtain a constant supply of their pelts. This experiment has succeeded best on a certain island in Bering Sea, where a large colony of arctic foxes is kept, guarded and tended by Eskimos, who feed them, and who once a year catch and kill a certain number when their fur is in its best condition.

AMERICAN FOXES

Besides the arctic fox, which of course is found in American as well as other arctic regions, this country has many species of fox that belong peculiarly to itself. William T. Hornaday, director of the New York Zoölogical Park, who has written many instructive things about animals, tells us in his "American Natural History" that north of Mexico this continent has sixteen distinct species of foxes, some of which have several subspecies.

The American fox most widely found is that which Mr. Hornaday calls "our wise old friend, the red fox," which is so well known in many parts of the country. It is a very cunning creature, "so well able to take care of itself that it refuses to be exterminated." Still we are told that it was not hard for the early settlers in this country to outwit the red foxes, and to shoot them and trap them when they came into the clearings where the settlers made their homes. It is easier to get the better of these animals in a wild region than where many people live, for the foxes are sharp observers and appear to learn many things from seeing what their human neighbors do. Naturalists tell us that in this way the American foxes have come to be almost as intelligent as those of the Old World. The red fox, we are told, "now holds his own against man, as much by boldness and audacity as by caution; few of our wild animals look on man with so little awe."

You must have read many stories illustrating this boldness of the fox, often shown in robbing hen-roosts and even catching chickens in the yards or the fields. And quite as remarkable are the accounts of foxes' cunning in avoiding hunters and hounds. In fact, they have often been known to follow the very hunter who was looking for them, as though they wanted to learn all his ways so as to be better able to baffle him.

The gray fox, which is somewhat smaller than the red fox, belongs especially to the southern part of the country, "but it ranges northward far into the home of the red fox." It is very

wild, and can move swiftly. Sometimes, to escape from dogs, it will climb a small tree and get far above the pursuer's reach. It is at its best only in the forest, and cannot hold its own as the red fox does, in a country much inhabited by men. With all his slyness the gray fox "lacks that astonishing shrewdness and faculty for working out deep-laid schemes which enables the red fox to turn the tables on the hunter."

All the different varieties of American fox are more or less closely related to the one or the other of these two—the red fox and the gray fox—so that naturalists class them in two groups, the red fox group and the gray fox group. If you learn all that you can about them you will find that you have obtained a great deal of interesting knowledge.

THE FENNEC

This is a very pretty fox-like little animal found in Nubia and Egypt. It is only about twenty inches long, including its big bushy tail, and its fur is sometimes pale fawn color, and sometimes creamy white. But what strikes one most about it is the extraordinary size of its ears, which are always carried perfectly upright, and look as if they were intended for an animal at least five times as big as itself.

The fennec is a creature of the desert, and lives in burrows which it scoops out in the sand. In order to make these burrows more comfortable, it lines them with leaves, hair, and the feathers of birds, while they are nearly always situated beneath the roots of plants, where the sand is softer and more easy to work. The animal digs with the most wonderful speed, and those who have surprised it while at a distance from its burrow say that it disappears in the sand just as though it were sinking into water, and is lost to sight in a few seconds.

The fennec spends the heat of the day comfortably curled up in its burrow, with its nose tucked away under its big bushy tail. When the sun sets it wakes up and goes off to the nearest water to drink, after which it hunts for jerboas, birds, lizards, insects, and the various other small creatures upon which it feeds.

THE HUNTING-DOG

Although a member of the great dog tribe, this animal is not really a dog. It looks very much like a spotted hyena, and yet it is not really a hyena. Sometimes it is known as the hyena-dog, and perhaps that is the best name which can be given to it.

These animals are found throughout Southern Africa, and are especially numerous in Cape Colony. They hunt in packs of from ten to fifty or sixty, which run with such wonderful speed that even the swiftest antelopes cannot escape them. When they catch up with their quarry they all spring upon it together, snapping at it over and over again until they bring it to the ground. And in a few minutes there is nothing left of its carcass but just a few of the larger bones.

In size the hyena-dog is about as big as a wolf. In color it varies a good deal, but the head is always black, with a white mark round the eyes, while the body is more or less mottled with black, white, and yellow. The long bushy tail is yellow at the root, black in the middle, and white at the tip.

CHAPTER X

THE WEASEL TRIBE

ALMOST all the animals which belong to this tribe have very long, slender bodies and very short legs; and the reason is a simple one. They feed on living prey, which they often have to follow through a long and winding burrow. Now if they had stout bodies or long legs they could not do this. Most likely they could not enter the burrow at all; and even if they did so they would be almost sure to find, before they had gone very far, that they could neither move forward or backward. But, having such snake-like bodies and such very short limbs, they can wind their way through the tunnels without any difficulty, and then spring upon their victim at the end.

They always try to seize their prey by the throat, in order to tear open the great blood-vessels which pass through that part of the body. One who had a personal experience of the strength and sharpness of their teeth thus tells it: "I was walking through a park one day early in the autumn, when I noticed that the dead leaves under a tree were tossing and tumbling about in a very curious manner. On going a little closer I found that a mother weasel and her little ones were playing together. When I came up of course they all ran away. So I ran after them, and caught one of the little animals by putting my foot on it, just hard enough to hold it down on the ground without hurting it. And immediately the little creature, which was only about six inches long, twisted itself round, and drove its sharp teeth into the edge of the sole of my shoe, both from above and below. So that if I had done what I thought of doing at first and had stooped to pick it up, its teeth would certainly have met in my finger."

The weasel is common in many parts of the United States as well as in Europe. In some regions you can scarcely take a walk along the roads or through the fields without catching

sight of it. Very likely it will poke its head out of a hole in the bank at the side of the road, and watch you in the most inquisitive manner as you go past. Or you may notice it slipping in and out of the herbage at the foot of a hedge, as it searches for the small creatures on which it feeds. But very often it will leave the hedge, and follow a mole along its burrow. Or it will make its way to a wheatstack, and pursue the mice through their "runs." And it is very fond of going out bird's-nesting, and robbing the nests of the eggs or little ones which they contain. But the weasel is not always successful when he sets out on one of these expeditions. While coming down Helvellyn, a mountain in England, a writer witnessed a strange little scene. "Hearing a loud chattering," he says, "I looked up, and saw just above me a pair of stonechats and a weasel. Evidently the weasel had come too near the nest of the birds, and they were trying to entice him away. And this is how they managed it. First the cock bird sat down on a stone about a yard in front of the weasel, and began to flap his wings, and to chatter and scream. The weasel immediately darted at him, and the bird flew away. Next the hen bird sat down on another stone a yard farther on, and began to flap her wings and to chatter and scream. Then the weasel darted at her, and *she* flew away. As soon as she had gone the cock came back, sat on a third stone, and played the same trick again. And so the two birds went on over and over again, till they got the weasel far up the mountain side, quite two hundred yards from the nest, when they quietly left him and flew away together.

"Wasn't it clever of them? And the odd thing was that the weasel never realized that he was being taken in, but evidently thought he was going to catch one of the birds every time that he darted at them."

When fully grown the European weasel is from eight to ten inches long, about one-fourth of that length being occupied by the tail. The fur of the upper parts of the body is brownish red in color, while that of the throat and lower surface is white.

In the United States are found various species of weasels, the

largest of which is called the New York weasel. The length of the male is sixteen inches, that of the female thirteen inches, the tail being more than one-third of the total length. It is also called the long-tailed weasel. The smallest species is the least weasel, only six inches long. Both bear much resemblance to stoats. "The various kinds of weasels in this country," say Stone and Cram in their "American Animals," "are much alike in their habits. . . . They hunt tirelessly, following their prey by scent, and kill for the mere joy of killing, often leaving their victims uneaten and hurrying on for more."

THE STOAT, OR ERMINE

This is the commonest and most widely distributed of all the weasel tribe. The name is British. The fur of the lower parts of the stoat's body is pale yellow instead of white, while the tip of the tail is black. In very cold countries the whole of the fur becomes white in winter, like that of the arctic fox, the tip of the tail alone excepted. Indeed, the famous ermine fur which we value so highly, and which even kings wear when they put on their robes of state, is nothing but the coat of the stoat in its winter dress.

The stoat preys upon rather larger animals than do other weasels, and many a hare and rabbit falls victim to its sharp little fangs. Strange to say, when one of these creatures is being followed by a stoat it seems almost paralyzed with fear, and instead of making its escape by dashing away at its utmost speed, drags itself slowly and painfully over the ground, uttering shrill cries of terror, although it has not been injured at all.

In poultry-yards the stoat is sometimes terribly mischievous. One stoat has been known to destroy as many as forty fowls in a single night. So both the gamekeeper and the farmer have very good reason for disliking it. But in some ways it is really very useful. It kills large numbers of mice and rats and voles, which often do such damage in the fields. And if we could set the good which it does against the evil, we should find that the former more than makes up for the latter.

THE POLECAT

This animal was formerly very common in Great Britain. But owing to its mischievous habits it has been greatly persecuted, and now it is very seldom met with. It is a good deal larger than the stoat, being nearly two feet in length from the nose to the tip of the tail, and you would think, on looking at it, that its fur was brown, yet it scarcely has a brown hair on the whole of its body. The fact is that the long outer hairs are so dark as to be almost black, while the soft under-fur next the skin is pale yellow; and as the inner coat shows through the outer one, the effect is very much the same as if the whole of the fur were brown.

The polecat is sometimes called the foumart. This name is formed from the two words foul marten, and has been given to the animal because it looks like a marten, and has a most foul and disagreeable smell. In its habits it is very much like the stoat. It comes out chiefly by night, and preys upon any birds or small animals which it may meet with, following rabbits down their burrows, tracking hares to their "forms," and sometimes killing nearly all the poultry, geese, and turkeys in a farmyard. Early in April it makes a kind of nest in a deserted rabbit-hole, or in a crevice among the rocks, and there brings up its family of from three to eight little ones.

The animal called polecat in North America is the skunk, of which we shall speak soon; the name is particularly applied to the common skunk of the Northeastern States and Canada.

THE FERRET

You know that the ferret is much used in hunting rabbits and rats. It appears to be really a variety of the polecat, and is usually of a yellowish white color with pink eyes. But there is also a brown form, which is generally called the polecat-ferret. It is known only in a domesticated form.

In some of the Western United States—Kansas, Colorado, etc.—is found the black-footed ferret, "often called



TYPES OF FUR BEARERS.

- | | |
|------------------------|------------------------|
| 1. Weasel; Ermine. | 2. Otter. |
| 3. Wolverine; Glutton. | 4. Pine Marten; Sable. |
| 5. Skunk. | 6. Badger. |

prairie-dog hunter because its specialty is the killing of prairie-dogs." It has not become very well known to animal students, for it dwells in burrows and hunts at night.

MARTENS

Old World martens may be described as large weasels that live in the trees. One of them, the pine-marten, is still found in the wilder parts of Great Britain, although it is even scarcer, perhaps, than the polecat.

This animal is about as big as a cat. But it does not look as large as it really is, because of the shortness of its legs. In color it is rich brown above and yellowish white below, while the tail is very long, and is almost as bushy as that of a squirrel.

Martens are only found in the thickest parts of the forests, and spend almost the whole of their lives in the trees, running up and down the trunks, and leaping from bough to bough with the most wonderful activity. They even make nests among the branches, in which to bring up their little ones, weaving a quantity of leaves and moss together in such a way as to make a most cosy little nursery. But it is to be feared that they are sometimes lazy animals, for just to save themselves trouble they will turn squirrels or woodpeckers out of their nests, and take possession of them for themselves.

Martens feed on any small animals which they can find, and have more than once been known to kill lambs, and even fawns. When they happen to live near the sea, it is said that they will visit the shore by night in order to hunt for mussels.

The American sable or pine-marten is about the size of a common domestic cat, and looks much like a young red fox. It is now rare south of Northern Canada.

The sable found in the mountainous forests of Northern Asia seems to be nothing more than a variety of the pine-marten with very long fur. This fur is so much in request that the animal is greatly persecuted, more than two thousand skins being sometimes taken in a single season.

THE GLUTTON, OR WOLVERENE

You would say that this animal hardly looks like a weasel at all, for it is very heavily and clumsily built, and, including the tail, is often as much as four feet long. If you did not know what it was, you might almost take it for a bear cub with a tail. It is blackish brown in color, with a lighter band which runs from the shoulders along the sides and across the flanks, as far as the root of the tail.

"Glutton" is rather an odd name for this creature, isn't it? But certainly the animal deserves it, for it will go on eating and eating, long after you would think that it could not possibly swallow a morsel more. Indeed, a glutton has been known to devour, at a single meal, a great joint of meat, which would have been more than sufficient for a lion or a tiger for a whole day! It lives in North America, and also in Northern Europe and Northern Asia, and the hunters find it a terrible nuisance, for night after night it will search along a line of traps and devour all the animals caught in them. Then, too, if they bury a quantity of provisions in the ground, meaning to come back and fetch them later on, a glutton is very likely to discover them and dig them up, while the animal is also fond of visiting their huts while they are absent, and stealing everything it can carry away.

Blankets, knives, axes, and even saucepans and frying-pans have been stolen in this way by gluttons, and once one of these animals actually succeeded in dragging away and hiding a gun! It is even a worse robber, in fact, than the arctic fox. And it can hardly ever be trapped, because it is so crafty that it almost always discovers the traps, and either passes them by or pulls them to pieces, while it is so wary, and so swift of foot, that the hunter very seldom has a chance of shooting it.

It was formerly supposed that this animal was even more crafty still, and that it would collect a quantity of the moss of which deer are so fond, lay it upon the ground as a bait, and hide in the foliage of an overhanging bough, so as to spring

down upon the animals when they stopped to feed. But this story seems to be quite untrue.

THE RATEL

More curious still is the ratel, which belongs to the family of badgers. You cannot possibly mistake it if you see it, for all the upper part of its body is grayish white, and all the lower part is black. So that it looks rather like a lady wearing a white mantle and a black skirt.

But if the ratel is odd in appearance, it is odder still in habits. If you go to look at them in a zoo you are sure to find them trotting leisurely round and round their cage in a perfect circle, one behind the other. And when they come to a certain spot they always stop, turn head over heels, pick themselves up, and then run on again. Why they do so nobody knows, but for hours every day they keep up this singular performance.

The ratel is very fond of honey, so fond that it is often called the honey-ratel, or honey-weasel, and it spends a good deal of time in prowling about in search of the nests of wild bees. You would think that it would get badly stung by the bees, wouldn't you, when it tore their nests open and robbed them of their sweet stores? But its coat is so thick that the insects can scarcely force their stings through it, while even if they do so there is a thick loose skin under it, and a layer of fat under that. So it seems quite certain that a ratel never gets stung, no matter how many nests he may rob.

The animal does not live entirely on honey, however, but also feeds upon rats, mice, small birds, lizards, and even insects.

Two kinds of ratels are known, one of which lives in Africa and the other in India.

THE BADGER

The European badger was formerly very common in Great Britain. It was generally known as the brock, and when we hear of a place called by such a name as Brockley, or Brockenhurst, we may be quite sure that it was once inhabited by a

great many badgers. Nowadays, however, these animals are more scarce in Great Britain and only to be found as a general thing, in the wildest parts of the country; and as they only come out of their burrows by night, very few people even see them in a state of freedom. But all over temperate Northern Europe and Asia the European badger is found.

Their burrows are generally made either in the very thickest part of a dense forest, or else on the side of a steep cliff which is well covered with trees. They run for some distance into the ground, and generally open out into several chambers, while at the end there is always a large hollow which the animals use as a bedroom. They like to be comfortable, so they always line this hollow with a good thick layer of dried fern and dead leaves. You would be quite astonished to find how much of this bedding is often packed away in the burrow of a single badger.

These animals are most cleanly in their habits, and are very careful not to take any dirt into their burrows with them. They have been known, for example, to use a low branch near the entrance as a scraper, and always to rub their feet upon it before going in. And every now and then they have a grand house-cleaning, turning out all their bedding, and taking in a fresh supply.

When the badger is digging, it uses its nose as well as its paws, shoveling the earth aside with it from time to time. And every now and then it walks backward to the entrance of the burrow pushing out the loosened earth in a heap behind it.

The teeth of the European badger are made in a very curious way, for they interlock with one another just like those of a steel trap. The jaws, too, are exceedingly strong, so that the animal is able to inflict a very severe bite. But it is a most peaceable creature, and never attempts to attack unless it is driven to bay.

As regards food, it will eat almost anything. It seems equally fond of mice, frogs, lizards, birds' eggs, snails, worms, fruit, beechnuts, and roots. If it finds a wasps' or a bumblebees' nest, it will dig it up and devour all the grubs and the food which has been stored up for them, caring nothing for the stings

of the angry insects. And very often it gathers a quantity of provisions together in a small chamber opening out of its burrow, which it uses as a larder.

The head of the badger is white, with a broad black streak on either side, which encloses both the eye and the ear. The body is reddish gray above, whitish gray on the sides, and blackish brown below, and the flanks and tail are nearly white. In length it is very nearly three feet from the muzzle to the tip of the tail.

The American badger, living in the western parts of North America, resembles its European cousin in nearly all respects, differing from it chiefly in the form of the teeth, in the habit of eating more flesh, and in liking open flat country better than the dense forests preferred by its Old World relation. Another difference is noted by Mr. Hornaday, who tells us that the American badger "has a savage and sullen disposition, and as a pet is one of the worst imaginable."

THE SKUNK

Many of the animals of the weasel tribe have a most disagreeable odor; but there is none whose scent is so horribly disgusting as that of the skunk.

This is a North American animal of about the size of a cat, with a long, narrow head, a stoutly built body, and a big bushy tail. In color it is black, with a white streak on the forehead, a white patch on the neck, and a broad stripe of the same color running along either side of the back.

The offensive odor of the skunk is due to a liquid which is stored up in certain glands near the root of the tail. This liquid can be squirted out at will to a distance of twelve or fifteen feet, and if the animal is attacked, or thinks itself in danger, it does not attempt to use its teeth, but just turns round, raises its tail, and sends a perfect shower of the vile fluid over its enemy. And it is almost impossible to wash the smell away. A drop or two once fell on the coat of a dog. The animal was washed over and over again, most thoroughly, with various kinds of soap. Yet a week later, when he happened to rub himself

against one of the legs of a table, no one could bear to sit by it afterward.

The skunk seems to know perfectly well how offensive its odor is, and never runs away if it meets a man, or even a large dog. It just stands perfectly quiet, like a cat expecting to be stroked, ready to make use of its evil-smelling fluid if necessary.

This singular animal lives in holes in the ground, making a warm little nest at the end in which to bring up its young. It feeds upon small animals, small birds and their eggs, frogs, lizards, and, most of all, upon insects.

OTTERS

Last among the members of the weasel tribe come the otters. These animals are specially formed for living in the water. The paws, for example, are very large and broad, and the toes are fastened together by means of a kind of web, like that on the foot of a swan or a duck, so that they form very useful paddles. Then the body is long, lithe, and almost snake-like, and the tail is so broad and flat that it serves as a capital rudder, and enables the animal to direct its course. The fur, too, consists of two coats of hair instead of only one; the outer, which is composed of long, stiff bristles, lying upon the inner like a very close thatch, and quite preventing water from passing through. So although an otter is dripping from head to foot when it comes out of the water, it never gets really wet.

The animal is wonderfully active in the water, and can easily overtake and capture the swiftest of fishes. Sometimes it is very destructive, for when fishes are plentiful it becomes so dainty that it never eats its victims, but just takes a bite or two from the best part of the flesh at the back of the neck, and then leaves the rest of the body lying upon the ground. So fishermen are not at all fond of it, and kill it whenever they can. But sometimes, when the rivers are very low, or when the surface of the water is thickly covered with ice, the otters find it very difficult to obtain a sufficient supply of food. So they leave the streams and wander far inland, sometimes making their way into the farmyards, and feasting upon poultry, or even upon

young pigs and lambs. But they only do this when they are in real danger of starvation, and always return to the river-banks as soon as they can.

The home of the otter is generally situated beneath the spreading roots of a large tree on the bank of a stream. The animal does not dig a burrow if it can help it, but prefers to take advantage of some natural cleft in the ground, at the end of which it makes a nest of flags and rushes. In this nest from three to five little ones are brought up, and if you were to lie very quietly on the bank for some little time early on a warm spring morning, you would very likely see the mother otter playing with her little ones, or teaching them how to swim and to catch fish.

The bite of the otter is very severe, and it is almost impossible to force the animal to loose its hold.

In India there is a kind of otter which is often trained to catch fish for its master. It is taught, first of all, to pursue an imitation fish as it is drawn through the water by a string, and to bring it ashore and lay it down upon the ground. Then a dead fish is substituted for the false one, and when the otter has learned to bring this to its owner, and to give it up at the word of command, it is sent in pursuit of a live fish fastened to a line. And before very long it learns its duties so thoroughly that it will catch fish after fish, and bring them back without attempting to eat them, just as a well-trained retriever dog will bring back the birds or the rabbits which its master has shot.

The otter of North America is still found, but not numerously, in the Carolinas and Florida, in some Rocky Mountain districts, in British Columbia and Alaska, and in the Canadian provinces.

There is also a kind of otter which lives in the sea, and is called the sea-otter. It is also known as the *kalan*. It is found on the coasts of the Northern Pacific, and is much larger than the common otter, often weighing as much as seventy or eighty pounds, and being nearly four feet in total length. Its fur is the most costly known, a fine pelt being worth \$600 or \$800 before dressing. This high price is due partly to the beauty of the fur, but mainly to its rarity.

CHAPTER XI

THE BEAR TRIBE

THE bears are very interesting animals. In no animals perhaps, are young folks more interested than in these, for they have many traits that endear them to little human admirers, while with older persons they have often lived on terms of intimate friendship. In our own country this interest in these fascinating animals was lately quickened, for children especially, by the almost universal possession and popularity among them of "Teddy bears," so named with playful reference to President Theodore Roosevelt, affectionately called "Teddy," and himself well acquainted with bears and other beasts, both wild and tame.

POLAR BEARS

One of the most interesting of all bears is the polar bear, which is found in almost all parts of the arctic regions. Sometimes it is called the white bear, on account of the color of its coat. But this is very seldom really white. Generally it is creamy yellow. And sometimes, in an old male, it is dingy yellow, and not even of the color of cream.

This is one of the largest of the bears, for it often grows to a length of nine feet, and weighs eight hundred or even nine hundred pounds. Yet it is wonderfully active, and it can run with very great speed. Indeed, if it were to pursue a man, he would have very little chance of escape. But it is not at all a quarrelsome animal, and although it will fight most savagely if it is wounded or driven to bay, using both teeth and claws with terrible effect, it very seldom attacks if it is not molested.

One of the first things that we notice on looking at a polar bear is the small size of its head and the length of its neck. This, no doubt, is to help it in swimming; for if it had a head as



TYPES OF BEARS.

- 1. Polar or Ice Bear.
- 2. American Black Bear.
- 3. Brown Bear ; Grizzly Bear.
- 4. A Marine Bear (California Seals).

big as that of an ordinary bear it would find it very much harder to force its way through the water. And of course it must be able to swim well, for otherwise it could never catch the porpoises and fishes upon which it feeds. We notice, too, the huge size of its paws, which are nearly eighteen inches long, and very broad as well. These form most excellent paddles, while the thick fur is so oily that it quite prevents the icy water from coming into contact with the skin.

The bear is very fond of feeding upon seals as well as upon porpoises and fishes. But these are so active in the water that it seldom attempts to chase them, preferring to creep quietly up to them as they lie sleeping on the ice. Then it kills them with one stroke of its terrible paw. Sometimes, too, it is said to prey upon the walrus, crushing in its skull by a series of tremendous blows before it can shuffle off the ice into the sea.

The feet of the polar bear are specially suited for traveling over the ice, for the soles are covered with long, thick hairs, which give it a firm foothold, and at the same time prevent it from feeling the cold of the frozen surface.

The young of these bears are born and brought up in a kind of nursery under the snow, which is so warm and snug that they do not feel the cold at all. Here they live with their mother until the snow melts at the return of warmer weather, and then for some months father, mother, and cubs all wander about together.

Polar bears sometimes live for a very long time in captivity. One of these animals lived in the London Zoo for thirty-four years, and another for thirty-three. The former of these once gave the keepers a terrible fright, for early one morning he managed to climb out of his enclosure, and when they found him he was just setting off on a journey of discovery into the Regent's Park. After a good deal of trouble they got him back, and altered his enclosure in such a way that he could never make his escape again.

THE BROWN BEAR OF EUROPE AND ASIA

This bear is found in most parts of Europe, and also throughout almost the whole of Asia north of the Himalayas. In for-

mer days it was not uncommon even in England, and in the time of Edward the Confessor the city of Norwich was obliged to kill a bear every year and send its body to the king.

These bears are found in wooded, hilly districts, often ascending to considerable heights in the mountains. In some parts of Asia they make regular tracks through the forest, in the form of pathways about two feet wide; and it is said that these tracks sometimes run for hundreds of miles. They are solitary animals, and it is not often that even a pair are seen together. But for several months after they are born the cubs go about with their mother.

This bear is generally supposed, when it fights, to try to hug its enemies to death, throwing its fore limbs round them, and crushing them in its embrace. But in reality it strikes a kind of side blow, and forces its great claws into its victim's body thus causing a terrible wound. Just before it strikes it rears its body erect, and sits for a moment almost perfectly still; and it is for this moment that an experienced hunter waits in order to send a bullet through its heart.

The brown bear of Europe and Asia can scarcely be called a beast of prey, though now and then, when it is very hungry, it will kill a pony or a sheep and feast upon its flesh. It eats roots, as a rule, digging them up with its great paws; and it is also very fond of fruit. It will rob the nests of wild bees, too, and feed greedily upon the honey, appearing to pay no attention to the stings of the angry insects. And sometimes it may be seen turning over large stones, in order to catch and eat the beetles, earwigs, centipedes, etc., which have been hiding beneath it.

Now and then, too, these bears have been known to catch fish. Their usual plan seems to be to wade out into a stream, in some place where the water is not more than about eighteen inches deep, and there to stand motionless until a fish comes swimming past. Then with one quick, sudden stroke the victim is killed, and the bear seizes it in its mouth and carries it to the bank to be devoured.

When bears catch fish in this way they are usually rather dainty, and only eat the best part of the flesh upon the back.

In cold countries these bears often hibernate during the winter, just as bats and hedgehogs do. They eat a great deal of food toward the end of summer, and become exceedingly fat, and then retire to hollow trees or caves and fall asleep for several months, during which they live on their own fat. In the spring, of course, when they wake up, they are very thin, but a few weeks of good feeding will bring them back into proper condition.

These brown bears are very easily tamed, and many "performing bears" belong to this species. It is not nearly such a large animal as the polar bear, its average length being only about six feet.

THE AMERICAN BROWN BEAR

The brown bear of America is closely allied to that of the Old World. It was first described by Sir John Richardson, who called it the Barrenlands bear. It has since been further described by Dr. Clinton Hart Merriam, chief of the United States Biological Survey. It differs from the grizzly in the smallness of its claws. The difference in the profile also is very marked—the brown bear having a profile like that of the European and Asiatic bear, while that of the grizzly is flat.

The brown bear of North America lives largely on the fruits and berries of the northern plants, on dead deer, and on putrid fish, of which quantities are left on the banks of the northern rivers. Whether the large brown bear of the Rocky Mountains is always a grizzly, or often this less dangerous race, is doubtful. The following is Sir Samuel Baker's account of these bears. He says: "When I was in California, experienced informants told me that no true grizzly bear was to be found east of the Pacific slope. There are numerous bears of three if not four kinds in the Rocky Mountains. These are frequently termed grizzlies; but it is a misnomer. The true grizzly is far superior in size, but of similar habits." There are certainly three Rocky Mountain bears—the grizzly, the brown, and the small black bear. There is probably also another—a cross between the black and the brown. It is a mistake to say

that the brown bears which come to eat the refuse on the dust-heaps of the hotels of the Yellowstone Park, and let ladies photograph them, are savage grizzly bears.

THE GRIZZLY BEAR

The famous grizzly bear, which lives in North America, is much bigger and stronger and more savage than the brown bears, so that it is really a very formidable animal. When fully grown, this huge creature is sometimes as much as nine feet long from the tip of the snout to the root of the tail, while it weighs at least 800 or 900 pounds.

The grizzly is a very distinct race of brown bear. It has a flat profile, like the polar bear. This enormous creature is barely able to climb trees, and has the largest claws of any—they have been known to measure five inches along the curve. The true grizzly, which used to be found as far north as 61° latitude and south as far as Mexico, is a rare animal now. Its turn for cattle-killing made the ranchmen poison it, and rendered the task an easy one. It is now only found in the northern Rocky Mountains and parts of northern California and Nevada. Formerly encounters with "Old Ephraim," as the trappers called this bear, were numerous and deadly. It attacked men if attacked by them, and often without provocation. The horse, perhaps more than its rider, was the object of the bear.

On a ranch near the upper waters of the Colorado River several colts were taken by grizzly bears. One of them was found buried according to the custom of this bear, and the owner sat up to shoot the animal. Having only the old-fashioned small bored rifle of the day, excellent for shooting deer or Indians, but useless against so massive a beast as this bear, unless hit in the head or heart, he only wounded it. The bear rushed in, struck him a blow with its paw (the paw measures a foot across), smashed the rifle which he held up as a protection, and struck the barrel on to his head. The man fell insensible, when the bear, having satisfied himself that he was dead, picked him up, carried him off, and buried him in another hole which it scratched near the dead colt. It then dug up the colt and

ate part of it, and went off. Some time later the man came to his senses, and awoke to find himself "dead and buried." As the earth was only roughly thrown over him, he scrambled out, and saw close by the half-eaten remains of the colt. Thinking that it might be about the bear's dinner-time, and remembering that he was probably put by in the larder for the next meal, he hurried home at once, and did not trouble the bear again.

Not so a Siberian peasant, who had much the same adventure. He had been laughed at for wishing to shoot a bear, and went out in the woods to do so. The bear had the best of it, knocked him down, and so frightfully mangled his arm that he fainted. Bruin then buried him in orthodox bear fashion; and the man, when he came to, which he fortunately did before the bear came back, got up, and made his way to the village. There he was for a long time ill, and all through his sickness and delirium talked of nothing but shooting the bear. When he got well, he disappeared into the forest with his gun, and after a short absence returned with the bear's skin!

THE BLACK BEAR

The black bear is also an inhabitant of North America, but is neither so common or so widely distributed as it used to be. There are two reasons for this. The first is that this bear is an extremely mischievous animal, and is very fond of visiting farm-yards, and carrying off sheep, calves, pigs and poultry. So the farmer loses no opportunity of shooting or trapping it. And the other reason is, that its coat is very valuable, so that the hunters follow it even into the wilder parts of the country, where settlers, as yet, have not made their appearance.

This animal is only about half as big as the grizzly bear, for it seldom exceeds five feet in total length. It never attacks man unless it is provoked. When driven to bay, however, it becomes a most formidable opponent, dealing terrific blows with its fore paws, and fighting on with furious energy even after it has received a mortal wound.

Early in the autumn the black bear generally goes into winter quarters. Finding a hollow under a fallen tree, or a cave

of suitable size, it gathers together about a cartload of dead leaves and ferns, and makes a snug, cosy nest. Very often it lays a number of branches on the top, to prevent the leaves from blowing away. Before very long, of course, this nest is deeply covered with snow, and the bear lies fast asleep inside it for four or five months, living on the fat which it stored up inside its body during the summer.

This bear is sometimes known as the musquaw, an Indian name.

SUN-BEARS

These animals are so called because they wander about by day, and like to bask in the hottest sunshine, instead of hiding away in some dark retreat, as most of the other bears do. They live in India and the larger islands of the Malay Archipelago. They are excellent climbers, spending a great part of their lives among the branches of the trees.

These bears have most curious tongues, which are very long and slender, and can be coiled and twisted about in the most singular way. Apparently they are used for licking out honey from the nests of wild bees.

Sun-bears are small, gentle creatures, and are easily tamed. In the zoo they are extremely playful, and you may often see them standing upon their hind legs and wrestling with one another, and then tumbling over and rolling upon the floor, evidently enjoying themselves very much. Their fur is smooth and glossy, and is jet-black in color, the chin and a crescent-shaped patch under the throat being white.

THE SLOTH-BEAR

Another name for this bear is the aswail—its East-Indian name. It is perhaps the oddest of all the bears, for it has very long and shaggy hair, a flexible snout which it is always curling and twisting, and a very awkwardly and clumsily built body. It walks with a curious rolling gait, crossing its paws over one another at every step it takes. And it has a queer way of eating

termites and ants by breaking open their nests with its great fore paws, blowing away the dust and fine earth, and then sucking up the insects by forcibly drawing in its breath through its lips. It makes such a noise when doing this that it can be heard from a distance of two or three hundred yards.

The sloth-bear is seldom seen abroad during the daytime, for the odd reason that the skin of the soles of its feet is so delicate that it cannot bear to walk upon ground which is heated by the rays of the sun. Sometimes, when a hunter has driven one of them from its lair and pursued it by day, he has found its feet most terribly scorched and blistered when at last he killed it, simply because it had been obliged to walk over rocks on which the midday sun was beating down.

When a mother sloth-bear has little ones, she always carries them about on her back. If she stops to feed they at once jump down, but always spring up again as soon as she moves on. Even when they are quite big they travel about in this way, and a sloth-bear may often be seen with a cub as large as a retriever dog perched upon her back, and another one trotting along by her side. And from time to time she makes the little ones change places.

If a mother is wounded while her cubs are with her, she always seems to think that one of them must have bitten her, and immediately gives them both a good sound box on the ears. If several of these animals are together, and one of them is struck by a bullet, it begins to howl and cry at the top of its voice. The other bears at once come running up to see what is the matter, and begin to howl and cry too, out of pure sympathy for its sufferings. Then the wounded animal thinks that they have caused his injuries, and begins to cuff them with his paws. They, of course, strike back, and very soon all the bears are buffeting and biting and scratching one another. They must be very stupid creatures, mustn't they?

The sloth-bear is a little more than five feet long when fully grown, and stands from twenty-seven to thirty-three inches in height at the shoulder. In color it is black, with a white crescent-shaped mark on the upper part of its chest, like that of the sun-bear.

THE PANDA

Besides the true bears, there are a number of smaller animals which belong to the same tribe.

One of these is the panda, wah, or bear-cat, which is only about as big as a rather large cat. It is rusty red in color, with darker rings upon the tail, the tip of which is black. The face is white, and the lower parts of the body are very dark brown.

The panda is found in the forests of the Eastern Himalayas, and also in Eastern Tibet. It is a very good climber and spends much of its time in the trees, searching for the nuts, fruits, and acorns on which it feeds. If it happens to find a bird's nest with eggs in it, it will suck them all, one after the other. And sometimes it will come down to the ground to make a meal upon roots, or the young shoots of bamboo.

The panda has rather large claws—just like those of a bear—and one would think that they would form very serviceable weapons. But the animal seems to have very little idea of fighting, and scarcely tries even to defend itself if it is attacked.

RACOONS

Next come the racoons, which live in America. The best known of them is the common racoon, found throughout the United States, and also in Central America as far south as Costa Rica.

This is a very pretty animal. In size it is about as big as a rather large cat, and is brown or grayish brown in color, with a tail that is very bushy and beautifully ringed with gray and black. The head is rather like that of a fox, with a whitish forehead, and a black patch just below it, enclosing the eyes.

Racoons may usually be seen in a zoo, and if you give one of them a piece of bread or biscuit it will take it in its fore paws, just as if the animal were a monkey, and then go and rinse it carefully in the little pond in the middle of its cage. It never eats a scrap of food without washing it in this curious manner,

and for this reason the Germans have given it the name of "Waschbär" or "washing-bear."

The fur of the racoon is so soft and thick that it is very valuable, and the animal is very much hunted. It is generally hunted by night, the hunters going out with a number of dogs, which soon drive the animal into a tree. They then sit in a circle round the trunk, while one of the hunters climbs the tree, drives the racoon to the end of the branch, and then shakes it violently till the poor creature falls to the ground, where it is quickly seized and despatched.

Racoons will eat almost anything. Sometimes they will visit a poultry-yard and kill a number of the fowls by biting off their heads. Or they will go down to the sea-shore when the tide is out to search for crabs and oysters, or to the creeks and streams to hunt for crayfish. They are fond, too, of mice, and young birds, and eggs, and lizards, and fresh-water tortoises, and even insects. Occasionally they make a meal on nuts or fruit; but although they are such capital climbers, and can run about among the tree-branches as actively as squirrels, they never appear to pluck fruits or nuts as they grow, but only to pick up those which have fallen on the ground.

In Northern Mexico and adjoining parts of the United States there is a small relative of the racoon called *cacomistle*, or American civet-cat (though it is not a real civet). This has a sharp, fox-like face, big erect ears, a cat-like body, and long furry ringed tail; and it makes a gentle and most amusing pet, of great service in keeping a house free from vermin. Hence it is often tamed and kept by miners and others who are glad of its lively company and need assistance in housekeeping.

THE COATI

Closely allied to the racoons is the *coati*, or *coati-mondi*, which you may recognize at once by its very long snout. This snout is turned up at the tip, and gives to the animal a most curious appearance, while it is continually being curled and twisted about like that of the sloth-bear. It is chiefly used

for rooting about in the ground in search of worms and insects. and when the animal is drinking it always turns up the tip of its snout as far as possible, in order that it may not get wet.

The coati can climb quite as well as the racoons and spends most of its life in the trees, seldom coming down to the ground except to feed or to drink. It has a queer way of descending a tree with its head downward, turning the hinder feet around in such a way that it can hook its claws into the little crevices in the bark. During the daytime it is generally fast asleep, using its long bushy tail partly as a pillow and partly as a blanket. But almost immediately after sunset it wakes up and begins to scamper about among the branches with the most wonderful activity, stopping every now and then to rob a bird's nest, or to poke its snout into a hole in search of insects.

The coati is about a yard in length, nearly half of which belongs to the tail. In color it is chestnut brown, with black ears and legs, while the tail has black and brownish yellow rings.

THE KINKAJOU

Only one more member of the bear tribe remains to be mentioned, and that is the very curious kinkajou, which is found in the forests of South and Central America. It is about as big as a cat, with very woolly fur of a light brown color, and a very long tail. This tail is prehensile, like that of a spider-monkey, and the animal never seems quite happy unless the tip is coiled round a branch. And if you make a pet of it, and carry it about in your arms, it will always try to coil its tail round one of your wrists.

It has a very odd tongue, too, so round and long that it looks almost like a worm. The animal can poke this tongue into the cells of a honeycomb, in order to lick out the honey, or use it in plucking fruit which would otherwise be out of its reach. And it descends the trunks of trees head first, just as the coati does.

CHAPTER XII

THE SEAL TRIBE

WE now come to a group of carnivorous or flesh-eating mammals which live in the water—the seals.

People sometimes think that these creatures are fishes; but that is quite a mistake, for their blood is as hot as our own, and they breathe by means of nostrils and lungs just as we do, and not by means of gills, like the fishes. Then they have not fins to keep their bodies upright in the water as fishes have, neither do they swim by means of their tails; and their bodies are covered with fur, not with scales.

HOW SEALS SWIM

So, you see, seals are very different from fishes, although they spend almost the whole of their lives in the water. But nature has formed them in such a way that they can swim and dive quite as well as the fishes can. Yet it is difficult to see how they do so. If you watch a tame seal swimming about in a large tank of water, you will see that it glides smoothly and swiftly and easily and gracefully along, rising and diving and turning with the most perfect ease; but *how* it swims you will not be able to tell at all.

You know, however, that you can row a boat by means of a single oar, if you work it from side to side at the stern. You will not travel very fast, partly because the oar is not very big, and partly because you are not very strong. But still the boat will move.

Now if you look at the hinder feet of a seal, you will see that they are very broad, that they are set far back upon the body, and that, if necessary, they can be placed side by side together. Then think of the body of the seal as a live boat, and of these

great broad feet as an oar worked from the stern, and you will be able to understand how the animal swims. It just places these feet side by side, and uses them in such a way that they act upon the water exactly as an oar does, while their strength is so great that they drive the body along very swiftly.

HOW THEY ARE KEPT WARM

But if the seal is a hot-blooded animal, how can it remain in the sea for days together without being chilled? If we go to the seaside, and wish to bathe, we are advised not to stay in the water for more than ten or fifteen minutes; and if we were to do so, we might be made seriously ill. Yet the seal can live for days, or even weeks, in the icy seas of the far north and yet never seem to suffer from the cold at all. How is this?

Well, the fact is that, first of all, nature has supplied the seal with a kind of mackintosh, to keep it dry. This mackintosh, in most seals, is made of a double coat of fur. First there is an outer layer of long, stout hairs, almost like bristles; and underneath there is generally another layer of soft, close hairs—those which you see in a lady's sealskin jacket. And in order to keep the water from passing through it, this double coat of fur is kept constantly oiled. All over the surface of a seal's skin are thousands upon thousands of little holes, each of which opens into a tiny bag of oil, and this oil is constantly oozing out on to the fur. So, you see, the furry coat really does act like a mackintosh, for it quite prevents the seal from ever getting wet.

When an animal lives in water which is often covered with ice, however, something more than a mackintosh is necessary in order to keep it warm; so under the mackintosh nature has provided the seal with a thick greatcoat. And this greatcoat is made of a substance much warmer than cloth, or even than fur. It is made of fat. Just under the skin, covering the whole of the body, is a layer of fat two or three inches thick. And this keeps the seal so warm that even when it is lying upon ice it never gets chilled in the least.

FULLY FITTED FOR ITS HOME

The nostrils and the ears of the seal are made in such a way that water cannot enter them when the animal is diving. They are furnished with little valves, which are so arranged that they close as soon as the water presses upon them. And the greater the pressure the more tightly they shut up, so that not the tiniest drop of water can ever enter them.

There is still one more way in which the animal is specially fitted for its life in the water. It has to feed on fishes, and fishes are very slippery creatures. If you have ever tried to hold a live fish in your hand you will know that it is a difficult thing to do, for the fish just gives a wriggle and a twist, and slips out of your grasp as if it had been oiled. So that it would seem quite impossible for the seal to hold its finny victims, even if it overtook and seized them. But when we come to look at its teeth we find that those which we call molars, or grinders, are set with long, sharp points; so that when a fish is seized they enter its body, and hold it in a grip from which there is no escape.

THE COMMON SEAL

There are many different kinds of seals, but we shall only be able to tell you about four or five of the best known.

The first of these is the common seal. It is found on both sides of the Atlantic Ocean and in the North Pacific. On some coasts it is much disliked by fishermen, owing to the great number of fishes which it devours. It is so cunning that it will even find its way in among the nets they have let down, feast heartily upon the captive fish, and then quietly swim out again, often doing the same thing day after day for weeks together. And it is almost impossible to destroy it, for it seems to know perfectly well when its enemies are on the watch, and will only expose its nostrils above the water when it comes up to the surface to breathe.

Very often fishermen consider it "unlucky" to kill a seal, so

that the animal is able to carry on its robberies without being interfered with.

The common seal, when fully grown, is about five feet long, and is yellowish gray in color, with a number of darker spots sprinkled over the body and sides. It is very active in the sea, and fairly active on land, for although it cannot walk it will shuffle along over the beach at a wonderful pace for such an animal. As it does so, it throws up a perfect shower of stones with its hinder flippers, and those who have chased it have often thought that it was doing so on purpose, and was actually throwing stones at them.

If this seal is caught when quite young and treated kindly, it soon becomes exceedingly tame. It has even been known to live indoors, like a dog or a cat, and to lie for hours together basking in front of the fire. And in more than one case, when its owner wished to get rid of it, and put it back into the sea, it swam after him, crying so pitifully as he rowed away that he could not bear to leave it, and took it home with him again after all.

SEA-LIONS

The sea-lions are so called because they are supposed to look very much like lions. But it is not easy to see the resemblance. Sometimes they are called hair-seals, because there is no soft woolly under-fur beneath the coating of thick bristles, as there is in most of the animals belonging to this family.

There are nearly always sea-lions to be seen in zoos, and they are so intelligent and clever that the keepers are able to teach them to perform many tricks. A wooden platform is built for them, with the upper end standing some feet above the surface of the water, and they are very fond of shuffling up this, lying at the end until a number of visitors have come close to the railings to look at them, and then diving into the water with a great splash, so as to send a shower of spray over the spectators.

There are several different kinds of these animals, of which the Patagonian sea-lion is perhaps the most numerous. It is found on both the Atlantic and the Pacific coasts of South

America, and is rather more lion-like than its relations, since it has a crest of long hairs on the back of its neck, which really looks something like a mane. But you cannot see this crest when the animal is wet, as it then lies down flat upon the skin. The color of the fur varies much, for the old males are brown, the females are gray, and the young ones are a rich chocolate, which begins to grow paler when they are almost twelve months old.

The California sea-lion is a distinct species of the Pacific coast, and is found from there to Japan. On the rocks off San Francisco is one of its ancient rookeries, and the animal is there preserved by the government as one of the sights of the bay. In traveling menageries and in zoos you may hear the California sea-lions loudly and continually barking.

A sea-lion that lived for a good many years in the London Zoo was exceedingly clever, for it would climb up and down a ladder, with either its head or its tail first, fire off a gun, kiss its keeper, and catch fishes in its mouth if they were thrown to it, just as a dog will catch a piece of biscuit. Cleverer still, however, were a party of sea-lions, established at the London Hippodrome in 1902, for they would play a kind of football with their heads, catching the ball and passing it from one to another in a most wonderful way, and scarcely ever missing it or making a mistake. They would take part, too, in a musical performance, one playing the drum, another cymbals, a third the horn, and a fourth the bells, while their trainer stood in the middle and beat time. And one of them would actually balance an upright pole, with a fish on the top, on the tip of its nose, waddle across the stage, still holding the pole upright, and then suddenly jerk the pole aside, and catch the fish in its mouth as it fell.

But sea-lions are rather expensive pets to keep, for they have such very large appetites. A single sea-lion will eat about twenty-five pounds of fish in a single day! And when one remembers that these seals are sometimes found in herds of hundreds of thousands, one would almost think that they must very soon devour all the fishes in the sea.

When fully grown the male of the largest species of sea-lion is often ten feet long and weighs a thousand pounds.

FUR-SEALS

The fur-seals are sometimes known as sea-bears, although they are not even as much like bears as the sea-lions are like lions. They are destroyed in very great numbers for the sake of their skins, which have a thick coating of soft fur under the stiff outer bristles. These bristles, of course, have to be removed before the fur can be used, and this is done by shaving the inner surface of the skin away until their roots are cut off. They can then be pulled out without any difficulty, while the roots of the under-fur, which are not nearly so deeply buried, are not hurt in the least. But the operation is not at all an easy one, and can only be performed by a highly skilled workman, and that is one reason why sealskin jackets are so expensive.

Another reason is that in almost every skin there are a number of flaws, all of which have to be most carefully cut out, after which the holes have to be filled up in such a way as to leave no traces of the operation. Then the fur has to be cleaned, combed, and prepared and dyed, so that the garments which are made from it really cannot be sold except at a very high price.

These seals are not hunted in the sea, for they are such good swimmers that it would be very difficult to kill them. So during the greater part of the year they are allowed to live in peace. But during the breeding-season they live on land, lying upon certain parts of the coast in enormous herds; and the seal-hunters visit these places, drive the young males to a distance from the rest, and there kill them by striking them on the head with a heavy club.

Such vast numbers of fur-seals were destroyed in this way that at last it became necessary to protect them, for fear lest they should be entirely killed off. So only a certain number may now be killed in each year.

The best known of the fur-seals is the northern sea-bear, which is found on both shores of the Northern Pacific. It used to visit the Pribilof Islands in enormous numbers during the breeding-season, but lately so many have been killed, despite protective laws, that now the herds are quite small.

THE HOODED SEAL

Another seal whose fur is very valuable is called the hooded seal, or crested seal, because the adult male has a singular growth upon the front part of the head. This hood or crest consists of a kind of bag of skin which lies just above the nose, and can be inflated with air at will. What its use may be in a state of nature is not known. But when the seal is hunted it is often of the greatest service, for the force of a blow which would otherwise have caused instant death is so broken by the crest that the animal is merely stunned for a few moments, and is able to slip into the water before the hunter returns to take off its skin.

This seal is rather a formidable animal when it is enraged, for it is quite large when fully grown, and uses both its claws and its teeth in fighting. The male animals are very quarrelsome among themselves, and most desperate battles take place.

These and other hair-seals lie in summer upon floating ice-fields where their young are born. Steamers filled with men find them off the coast of Labrador, land on the ice, and kill thousands for the sake of their skins and the oil tried out of the blubber or underlying fat.

THE SEA-ELEPHANT

One of the biggest of all the seals is the great sea-elephant, also called elephant-seal, which frequents the shores of many of the islands in the Antarctic Ocean. It owes its name partly to its enormous size, the old males sometimes reaching a length of eighteen or even twenty feet, and partly to its very curious trunk, which is sometimes as much as a foot long. In the females and the young animals this trunk is wanting, and even in the male it is seldom seen unless the animal is excited, when it can be blown out very much like the bag of the hooded seal.

The fur of the sea-elephant is much too coarse to be of any great value. But its skin can be made into excellent leather, while the thick coat of blubber which lies beneath it furnishes

large quantities of useful oil. The consequence is that the animal has been much hunted, and is now comparatively scarce even in districts where it was once very common. It is not nearly so fierce as the hooded seal, and almost always takes to flight if it is attacked, its huge body quivering like a vast mass of jelly as it shuffles awkwardly along over the beach. But the males fight most fiercely with one another, inflicting really terrible wounds by means of their tusk-like teeth.

THE WALRUS

The strangest of all the seals is the walrus, whose tusks, representing the canine teeth, are sometimes as much as two feet long.

This animal is found only in the northern parts of the Atlantic and Pacific oceans, and is not often seen outside the arctic circle. Formerly it was far more widely distributed, and in the Atlantic was even seen frequently as far south as the Gulf of St. Lawrence; but it has been so persecuted by hunters that it has quite disappeared from many districts where once it was in great numbers.

The walrus is not quite so large as the sea-elephant, nevertheless, it is a very big animal, for a full-grown male will often measure twelve feet in length, and will weigh nearly a ton. It uses its tusks for many different purposes. When it wants to climb upon an ice-floe, for example, it will dig them deeply into the ice, and so obtain purchase while it raises its huge body out of the water. They are very formidable weapons, too, and the animal can strike so quickly with them, both sideways and downward, that it is not at all easy to avoid their stroke. Then they are very useful in obtaining food. If a walrus finds the body of a dead whale, it will cut off huge lumps of the flesh by means of its tusks; and very often it will dig in the sandy mud with them for mussels and cockles. The consequence is that the tusks are frequently broken, while they are nearly always very much worn at the tips.

The name walrus is a corruption of whale-horse. The animal is sometimes known as the sea-horse, and also as the morse.

CHAPTER XIII

THE WHALE TRIBE

THE whales are more thoroughly creatures of the water than even the seals, for they never come upon dry land at all, even during the breeding-season. Indeed, if a whale is unfortunate enough to be thrown upon the shore by a great wave, and left stranded, it cannot possibly make its way back into the sea, but is obliged to lie there till it dies.

Yet we must not think that these giant creatures are fishes; for they are as truly mammals as the seals are. Their blood is hot, and is driven through the body by a heart made up of four chambers, instead of only two. They breathe by means of nostrils and lungs, and not by means of gills. And besides that they suckle their young, just as all other mammals do.

Then, once more, if you look at the body of a whale, you will see that its tail is quite different from that of a fish. The tail of a fish is upright, but that of a whale is set crosswise. So that there is only one respect in which whales are really like fishes, and that is the general shape of the body.

These huge animals fall naturally into two families, the first consisting of those which have teeth, and the other of those which have whalebone, or baleen, instead. But in many ways the members of both these families are alike.

HOW WHALES BREATHE

All whales, for example, breathe in a very curious way. No doubt you have heard of the "spouting" of these animals, and perhaps you may have seen a picture of a whale lying on the surface of the sea, and throwing up a great column of water from its nostrils, or blow-holes. These pictures, however, are rather exaggerated, for what really happens is this: A whale, as of course you know, often remains under water

for a very long time, and when at last it rises to the surface, the air in its lungs is heavily laden with moisture. When the air is discharged through the blow-holes into the cold atmosphere the moisture condenses at once into a kind of misty spray, just as that in our own breath does in very cold weather. This is what one sees when a whale is spouting, although as the animal sometimes begins to blow while its nostrils are still beneath the surface, a small quantity of sea-water may, perhaps, be thrown up too.

A whale, if it is not disturbed, will often blow fifty or sixty times in succession. Let us try to explain why it does so.

If *you* try to hold your breath, you will find that it is very difficult to do so for more than three-quarters of a minute. But if, before you make the attempt, you get rid of as much of the air in your lungs as you possibly can, draw in a very deep breath and get rid of that, and then repeat the process about half a dozen times, you will find that you can hold your breath quite easily for at least a minute and a half. The reason is that by breathing so often and so deeply you have purified all the blood in your body, instead of having, as usual, a very large quantity which has done its work, and requires to be refreshed in the lungs before it can be of any further use.

Now the whale spouts fifty or sixty times in succession for just the same reason. It is taking a series of deep breaths so that it may purify all the blood in its body, and be able to remain under water for as long a time as possible without having to rise to the surface for air. And, besides this, there is a most wonderful arrangement in its body which enables it to stay below for very much longer than would otherwise be possible. Inside its chest it has a sort of blood-cistern, so to speak, consisting of a number of large vessels, which contain a great quantity of extra blood, besides that which is circulating through the body. This blood, also, is purified when the whale spouts. Then, when the animal has remained under water for some little time, and begins to feel the want of air, it does not rise to the surface at once, in order to breathe, but just pumps some of the extra blood from this curious cistern into its veins and arteries, to take the place of that which is used up and requires to be purified.

This it can do over and over again until all the extra blood-supply is used up too, when it is obliged to rise and spout.

As a general rule a whale spends from ten to twelve minutes in spouting, and can then remain under water, if necessary, for considerably more than an hour.

It is owing to this singular method of breathing that whales can be so easily killed. The object of the hunters is simply to drive them below before they have finished spouting. They do this again and again, and the consequence is that the poor animal soon becomes completely exhausted and falls an easy prey.

THE WHALE'S BLUBBER

You remember, don't you, how the seals are protected from cold, partly by their thick and oily fur, and partly by the layer of fat which lies just under the skin? Well, the whales are protected in much the same way. They have no fur, of course; but the layer of fat, which we call blubber, is always several inches in thickness, and is sometimes as much as two feet; so that the whale is never chilled by living in the water, even when it has to make its way through floating ice.

This blubber has another use as well. When the whale dives to a great depth—and sometimes it sinks half a mile or more beneath the surface of the sea—the pressure on its body becomes enormously great because of the weight of the water above it. If you were to dive to half that depth you would die. But the blubber of the whale is so elastic that it resists the pressure just as a great thick sheet of india-rubber would, so that the animal does not suffer from it in the least.

MISTAKES OF ARTISTS

Sometimes you see pictures in which whales are drawn with very big eyes, very long ears, and perhaps even with their tongues hanging out of their mouths. Now such pictures are drawn by artists who know nothing about whales, for the eyes of these animals are quite small, their outward ears are merely little holes in the skin, closing by means of self-acting valves like

those of the seals, and the tongue cannot be poked out of the mouth at all.

Now let us learn something about the different kinds of whales.

TOOTHED WHALES

First come the toothed whales, or denticetes. As an example of these we will take the famous sperm or spermaceti whale, which is also known as the cachalot.

This whale has nearly all its teeth in the lower jaw, the upper one only having a very short row of small teeth on either side. The lower teeth are five or six inches long, and fit into pits in the upper jaw when the mouth is closed. These teeth are composed of beautiful ivory, and were formerly valued so highly by the natives of the South Sea Islands, that more than once a tribe has actually gone to war with another tribe simply to obtain possession of a single whale's tooth.

Now that it has been hunted so much, apparently the sperm-whale does not grow to so great a size as it did in days gone by. Yet it is a very big animal, for a full-grown male will attain to a length of sixty or even seventy feet, while even a baby whale is from eleven to fourteen feet long, or as big as a big walrus. And, strange to say, the head is almost as large as the body and tail put together. This is chiefly due to the fact that there is a great cavity in the skull, which contains the valuable substance we call spermaceti. When one of these whales is killed, the head is cut off, and a kind of well is dug in the forehead, from which the spermaceti is drawn to the surface in buckets, as much as thirty barrels being sometimes taken from a single animal.

Besides this, the blubber yields a large quantity of very valuable oil, which burns with much clearer and stronger light than ordinary whale-oil. And sometimes a curious substance called ambergris is found in its body. It is used in making certain kinds of scent, and is quite costly, although as much as fifty pounds of it have sometimes been taken from a single whale.

Sperm-whales are generally seen in companies, which are known as schools. In olden days there were sometimes as many as two hundred whales in one of these schools. But so many of the great creatures have been killed by whalers that it is now quite the exception to see more than four or five together.

These whales are very playful creatures, and may often be seen gamboling on the surface of the sea, and now and then breaching, or leaping completely out of the water and falling back again with a tremendous splash. They feed chiefly upon the great cuttles, or squids, which are so plentiful in some parts of the ocean, but also devour large numbers of cod and other fishes. But how they manage to catch these fishes nobody quite seems to know.

These whales were formerly hunted by means of a small boat, in the bow of which stood a man with a long spear, or harpoon, in his hand, attached to an enormous coil of rope. As soon as this was hurled at a whale the boat was backed, so as to escape the stroke of its tail, and the whale would then sound, or dive to the depth of perhaps three-quarters of a mile. As soon as he rose he was driven down again, as already described, before he had had time to finish spouting, and at last, when quite exhausted, was killed by means of a very long and sharp-edged lance. Nowadays, however, the harpoon is generally fired from a ship by means of a gun, and as a charge of gun-cotton is placed in the harpoon's head, which explodes as soon as the weapon enters the body of the whale, such a severe wound is caused that the animal very soon dies.

BOTTLE-NOSED WHALES

These whales are so called because their muzzles are produced into beaks shaped somewhat like bottles. Although they belong to the toothed whales they only have two teeth in the lower jaw, and even these are so small that they are completely buried in the gum.

By the side of the cachalot the bottle-nosed whale seems quite a small animal, for even the full-grown male seldom exceeds thirty feet in length, while the female is quite six feet shorter.

It yields, on an average, about two hundredweight of spermaceti and two tons of oil. Its color, strange to say, is continually changing all through its life, for the young animals are black above and the older ones brown, which grows lighter and lighter as time goes on, till at last it becomes almost yellow.

These whales seem to be very sympathetic creatures, for if one of them is wounded, its companions generally swim round and round it, and will even allow themselves to be killed one after the other rather than take to flight. But they are also rather stupid animals, for if they happen to find themselves near the coast they seldom seem to realize that they can easily escape by turning round and swimming out to sea, but leap and tumble about in a state of great terror till at last a big wave comes and throws them up on the beach.

WHALEBONE-WHALES

The members of the other great group of these animals are called whalebone-whales, because they have whalebone in their mouths instead of teeth.

Of course this substance is not really bone at all. It consists of a kind of horny material which grows all round the upper jaw in a series of flattened plates, which are usually very long, and hang downward from the edge of the palate. Each of these plates, at the tip, is broken up into a sort of hair-like fringe; so that when the jaws are partly closed there is a kind of sieve, or strainer, between them, through which everything must pass that goes in or out of the mouth.

This sieve is used in feeding. It seems strange that an animal so huge as a whale should feed on some of the smallest creatures which live in the sea. Yet such is the case, for the throats of the whalebone-whales are so narrow that one of them would almost certainly be choked if it tried to swallow a herring. So these whales live upon very small jellyfishes, and the young of shrimps, prawns, tiny crabs, etc., which often swim about in such vast shoals that for miles and miles the sea is quite alive with them. When the whale meets with one of these shoals it opens its mouth wide and swims through it. Then it partly

closes its mouth, and squirts out the water which it has taken in through the whalebone strainer, the little animals, of course, remaining behind. These are then swallowed, a few thousand at a gulp, and the whale opens its mouth and repeats the operation over and over again, until its enormous appetite is satisfied.

Most of the whalebone which we use is obtained from the bowhead, or Greenland whale, which is found in the northern seas. This animal is from forty to sixty feet long when fully grown, and the baleen plates are often ten or even twelve feet in length, while there are nearly four hundred of them on each side of the upper jaw. In a large whale these plates weigh more than a ton, and are worth at least \$15,000. Then from 130 to 150 barrels of oil will be obtained from its blubber; so that a big Greenland whale is a very valuable animal.

But whales of this size are now very rarely met with, and there seems to be some danger that before many years have passed away these giant creatures will be almost extinct.

RORQUALS

The rorquals are sometimes known as fin-whales, or finbacks, because they have an upright fin on the hinder part of the back. They are not so valuable as the Greenland whale, because their baleen is of inferior quality, and is very much shorter, while their blubber does not yield nearly so much oil, and they can swim with such speed that they are very much harder to catch.

The common rorqual grows to a length of about sixty or sixty-five feet, and is found throughout all the northern seas, and occasionally even in the Mediterranean. It is a solitary animal as a rule, but schools of from ten to fifteen individuals are sometimes met with, and may be seen leaping into the air, and rolling and tumbling about in the water, as though they were having a game of play together.

The rorqual feeds partly upon the small creatures which it captures by means of its whalebone strainer, and partly upon fishes. How vast its appetite is you can judge from the fact that as many as six hundred large codfish have been found in the stomach of one of these animals, together with a number of

pilchards. Sometimes a rorqual will come quite near the coast, and remain in a fishing-ground for weeks together, and as it swallows several boatloads of fish every day, it is scarcely necessary to say that the fishermen are not at all pleased to see it.

There is another kind of whale, called the lesser rorqual, which only grows to the length of about twenty-five or thirty feet. It is common off the shores of Norway, and commoner still in North American waters, where it is known as the sharp-nosed finner. It is a very playful animal, and is said sometimes to gambol round and round a ship for miles, now and then diving underneath it on one side and coming up on the other.

THE DOLPHIN FAMILY

Next we come to the dolphin family, which includes the narwhal, the grampuses, and the porpoises, as well as the true dolphins.

THE NARWHAL

This is a curious animal, for the male has a very long straight tusk projecting from one side of its upper jaw. This tusk is often as much as seven or eight feet in length, and the ivory of which it is made is twisted round and round in a spiral from base to tip. In former days this tusk was thought to be the horn of the unicorn, and the narwhal is often known as the sea-unicorn.

In reality, this tusk is the left-hand upper "eye" tooth of the animal, that on the right-hand side being very small and completely buried in the bone of the jaw. Now and then, however, both teeth are developed, and a narwhal was once killed which had one tusk seven feet five inches long and the other seven feet. There are no other teeth in the mouth, and the female animal has no tusks at all.

Now what is the use of this singular weapon? Two or three answers have been given to this question. Some people have supposed, for example, that it is used in spearing fish, or in digging up buried mollusks from the mud at the bottom of the sea. But the female narwhals require food just as much as

the males do; how is it that they are not provided with tusks also?

Other people have thought that when the winter is very severe, and the ice on the surface of the sea is very thick, the animal could bore a hole through it with its tusk, and so be able to breathe. But then again, female narwhals require air just as they require food. So this suggestion will not do either.

The only explanation we can really give is that the narwhal's tusk is a weapon used in fighting, just like the antlers of the male deer. At any rate, narwhals have several times been seen as they were taking part in a kind of make-believe battle, and striking and clashing their tusks together just as though they were fencing with swords. And when they are fighting in earnest they must be able to use their long spears with terrible effect, for several times a narwhal has charged a ship, and driven its tusk so deeply into her timbers that it was quite unable to withdraw it.

The ivory of which this weapon is made is of very fine quality. But as the tusk is hollow for the greater part of its length it is not very valuable.

Narwhals are only found in the half-frozen seas of the far north, where they are sometimes seen swimming side by side together in large companies. They grow to a length of twelve feet or over, and are dark gray in color on the upper part of the body, and white underneath, the back and sides being more or less mottled with gray.

THE WHITE WHALE

The white whale, or beluga, is something like a large narwhal without a tusk, and is also a dweller in the northern seas. But it often ascends the larger rivers for hundreds of miles in search of fish. Now and then it has been killed off the coasts of Scotland, and one example lived for quite a long time in the Firth of Forth, going up the river day after day as the tide came in, and always retreating as it began to fall. The fishermen were very anxious to kill it, because of the quantities of fish which it de-

voured. But it was so quick and active that it eluded them over and over again, and three whole months passed away before at last they succeeded.

In one or two of the great rivers of North America white whales are regularly hunted, the animals being first driven up the stream, and then caught with nets as they return. They yield a large quantity of very pure oil, and the "porpoise-hide," which is used so largely in making boots and shoes, is in reality prepared from their skins.

THE TRUE PORPOISE

The true porpoise, or sea-hog, is much more widely distributed. It likes to tumble and gambol on the surface of the sea quite close to the shore. It will ascend tidal rivers too. Its range is mainly along the Atlantic coast, and it is also found on coasts of Europe and in the Pacific Ocean. Chasing porpoises in canoes, and spearing them, is an exciting Canadian sport.

Porpoises have a curious way of swimming, for they travel along by a series of bounds, first of all leaping almost out of the water, and then diving under it. When a number of them are moving along in this way one behind the other, as they very often do, they look from a little distance just like an enormous snake winding its way through the water, and no doubt have given rise to some of the tales about the great sea-serpent.

A herd of porpoises will frequently follow a sailing ship for days, sometimes, apparently, out of pure curiosity, and sometimes in the hope of picking up something eatable among the rubbish that is thrown overboard. But they are very much afraid of steamships, and always keep at a respectful distance from them. They feed chiefly on fish, and are so quick and active that even the salmon cannot escape from them, while they will follow up shoals of mackerel and herrings and destroy them in enormous numbers.

When fully grown the porpoise is rather more than five feet long. The upper part of the body is almost black in color, becoming paler on the sides, while the lower surface is almost pure white.

THE GRAMPUS

The largest and fiercest of all the members of the dolphin family is undoubtedly the grampus, which is also known as the killer, or killer-whale. It often reaches a length of twenty feet, or even more, and is so savage and voracious that it has sometimes been called the wolf of the sea. One of these animals was once found floating on the surface of the sea, choked by a seal which it had attempted to swallow; and when its body was opened fourteen other seals and thirteen porpoises were taken from its stomach.

Three or four killers will often combine in an attack upon a large whale, leaping upon it again and again, and striking terrific blows upon its body with their tails, hanging upon its lips like so many bulldogs, biting and tearing its flesh, and often actually killing it. The whale seems terrified by the onslaught of the ferocious creatures, and sometimes scarcely attempts to resist them, apparently knowing quite well that they are sure to be victorious in the end.

The grampus is most plentiful in the northern seas, but is found now and then in almost all parts of the ocean. It occasionally visits the British shores. Once a living specimen was exhibited in the Brighton Aquarium, and did very well for some little time. But one day it got its snout jammed in the rock-work at the bottom of its tank, so that it could not rise to the surface to spout. And when the keeper discovered what had happened to it the poor creature was dead.

THE BLACKFISH

Almost as large as the grampus, but not nearly so savage, is the blackfish, which is so called on account of its color, for it is not a fish, being a member of the dolphin family. It is found in great shoals, generally consisting of two or three hundred animals, and often of a great many more, which are always under the guidance of a single leader. Wherever he goes they

will always follow, and they are such stupid creatures that if he swims into shallow water and casts himself ashore, they will all swim after him and fling themselves on the beach also. In Iceland, and also in the Faroe Islands, large numbers of them are often killed, the fishermen arranging their boats in a semi-circle between the shoal and the deep sea, and then driving them forward till they strand themselves upon the shore in their efforts to escape. Large herds have also been driven ashore in the Orkneys and the Shetlands.

On the east coast of North America the blackfish is one of the most abundant cetaceans. Off Cape Cod more than a hundred blackfish have been seen in one school, and they are eagerly hunted for the sake of the soft oil yielded by their fat.

DOLPHINS

There are two groups of dolphins, the first of which contains three animals that live in rivers, and therefore are generally called fresh-water dolphins.

The only one of these that we can mention is the Gangetic dolphin, which inhabits the great rivers of India, and is named from the Ganges. Its chief peculiarity is that it is almost totally blind. Although the animal grows to a length of seven or eight feet, and is bulky in proportion, yet its eyeballs are no larger than peas, while the nerves of sight are so imperfect that it is quite possible that it may not be able to see at all. This is no deprivation to it however, for the rivers in which it lives are always so thick with mud that even if it had properly developed eyes it would be quite unable to use them.

The Gangetic dolphin is very seldom seen, because when it comes up to breathe it only raises just the blow-holes above the surface of the water. For the same reason, we know very little indeed about its habits. But it seems to feed on fresh-water shrimps and mollusks, and also on certain fishes which lie half-buried in the mud at the bottom of the water, rooting about for them with its snout after the manner of a pig. This animal is often known as the susu.

SEA-DOLPHINS

Of the sea-dolphins we can only notice two. The first of these is the common dolphin, which is found in great numbers in almost all parts of the temperate and tropical seas. Apparently it is not often to be found on American coasts, but it has been captured in eastern harbors. It generally lives in herds, which will follow ships for hours together, leaping and gamboling on the surface of the sea, and yet keeping pace with the vessel without the least apparent effort. It feeds on fishes, to capture which, and hold them firmly, it has one hundred and ninety teeth, so arranged that when the mouth is closed the upper and lower ones fit in between one another like those of a steel trap and hold the prey in a grip from which there is no escape.

A full-grown dolphin is usually about seven feet long, but much larger specimens are occasionally found. The color is dark gray or glossy black above, and almost pure white on the lower parts of the body.

The bottle-nosed dolphin is a rather smaller animal, with a shorter and more pointed beak shaped rather like the neck of a bottle, and is purple black above and grayish white below. Its range is on the North Atlantic coast from Maine to Florida, on the Gulf coast, and also on some of the coasts of Europe.

MANATEES AND DUGONGS

There is just one other family of water-mammals which it will be convenient to mention here, although they do not really belong to the whale tribe. These are the very curious creatures known as sirenians, the best known of them being the manatee and the dugong.

Of course you have heard of mermaids, those imaginary creatures of the sea, which were supposed in days of old to combine the head and body of a woman with the tail of a fish. Well, very likely stories of them were told in the first place by some traveler who had seen a manatee, for the animal has a queer way of raising its head and the upper part of its body

almost upright out of the water and cuddling its little one in its flippers, so that from a little distance it really looks something like a human being with a child. But at close quarters the comparison would not be a very flattering one, for there is a kind of disk-like swelling at the end of the snout, and the skin is black and coarse and wrinkled like that of an elephant.

Manatees are found on the west coast of Africa, and also on the shores of South America, living near the mouths of the larger rivers. They never seem to leave the water of their own accord, and if by any chance they find themselves upon dry land, they are perfectly helpless, and can only roll over and over. One specimen seen in a zoo was quite a small animal, and had to be fed with milk out of a baby's bottle, while the keeper nursed it upon his knees. When it grew a little bigger it became very playful, and would tumble and roll about in its tank almost like a dolphin or a porpoise. And more than once it even succeeded in knocking its keeper into the water.

Another of these animals, caught at the mouth of the Essequibo River, lived in an aquarium for sixteen months. It was about eight feet long, and its tail was so powerful that every one was afraid the sides of its tank would be broken in by its tremendous blows. Its appetite was remarkably good, for it used to eat as much as eighty-four pounds of lettuces every day.

There is a species of manatee, also called sea-cow, formerly ranging the South Atlantic and Gulf coasts of the United States, but now seen only in the rivers and lagoons of southeastern Florida, where it has become so rare that the State prohibits its wanton destruction under penalty of a heavy fine.

The dugong is found on the east coast of Africa, and also on the coasts of Mauritius, Ceylon, the islands of the Indian Archipelago, and Western Australia. In many respects it is very much like the manatee. But it has a forked tail instead of a rounded one, and its body is bluish black above and whitish below. It lives in shallow water near the mouths of rivers, feeds on various water-plants, and is said to be so affectionate that if one of a pair is killed the other cannot be induced to leave the dead body, but will remain by it and allow itself to be slaughtered also.

Not very many years ago dugongs were found in large herds, sometimes consisting of two or three hundred individuals, and were so tame that they would even permit themselves to be touched without attempting to escape. But they have been killed in great numbers for the sake of their hides and a valuable oil which is extracted from their bodies, so that nowadays it seldom happens that more than two or three are seen together.

A full-grown dugong is generally from seven to eight feet long, and measures about six feet round the body. The Australian dugong is said to attain a length of fourteen feet.

CHAPTER XIV

THE RODENT ANIMALS

THE group of the rodents is the largest of all the tribes of mammals, for it contains more than a thousand different animals. Indeed, nearly one third of all the mammals in the world belong to this very important division.

TEETH OF THE GNAWERS

The word rodent signifies gnawing, and is given to these creatures because their front teeth are specially formed for the purpose of gnawing hard substances. You know, of course, how long and sharp the front teeth of a rat or a mouse are, and how easily these animals can nibble their way through a stout piece of board. Well, all the rodent animals have these teeth formed in just the same way. And when we come to examine them we find that they are beautifully suited to their purpose.

You would think that as they are so constantly in use, these teeth would quickly be worn down to the gums, wouldn't you? Ours would, if we employed them in the same way. But then, in the rodent animals, these teeth never stop growing, so that as fast as they are worn from above they are pushed up again from below.

Sometimes this fact leads to a very singular result. It happens now and then that a rodent animal meets with an accident and breaks off one of its front teeth. Now these teeth, remember, cannot be used unless they have one another to work against, just as the blades of a pair of scissors cannot be used unless they have one another to cut against. So, you see, when one tooth is broken short off, the opposite tooth in the other jaw becomes useless. It has nothing to work against. So it is no longer worn away from above. But of course it still

goes on growing. So before very long it projects in front of the other teeth. Still it continues to grow, and in course of time its natural curve brings it round in a semicircle, with the point toward the face. And at last, if it is a lower tooth, it pierces first the flesh of the forehead and then the skull beneath it, and enters the brain and kills the animal; while, if it happens to be an upper tooth, the point curls round under the chin and at length prevents the poor creature from opening its mouth, so that it dies miserably of starvation! It seems impossible, doesn't it? Yet in museums there are skeletons of hares and rabbits which have been killed in this singular way by one of their own front teeth.

HOW THE TEETH ARE KEPT SHARP

One would think that the edges of the teeth, at any rate, must soon be worn away. Nature has guarded against this danger by making these teeth of two different substances. The face of the tooth is made of a very thin plate of hard enamel, the rest of the tooth of much softer bone. During use, of course, the soft bone is worn away very much faster than the hard enamel, and so the sharp, cutting edge is preserved.

It is interesting to find that we make our chisels in a very similar way. The blade is not a solid piece of steel, of the same quality throughout; it consists of steel of two different qualities. The face of the tool is a very thin plate of extremely hard steel, but the rest is of much softer metal. And as it is with the rodent's tooth, so it is with the chisel. The soft metal is worn away during use much faster than the hard, so that the edge is not destroyed.

Only two pairs of front teeth are developed in the rodent animals, and as the "eye" teeth are wanting there is always a gap in each jaw between these and the grinders.

THE COMMON SQUIRREL

First on our list of rodent animals comes the common red squirrel, which of course you know by sight very well. There

are very few parts of the country where we may not see it frisking and gamboling among the branches of the trees, or sitting upright on its hind quarters and nibbling away at a nut, which is delicately held between its front paws.

It skips up the trunk of a tree quite as easily as it runs along the ground. That is because its sharp little claws enter the bark, and give it a firm foothold. And it scarcely ever falls from a branch because its big bushy tail acts as a kind of balancing-pole, like that of a man walking upon a tight rope; and by stretching it straight out behind its body, and turning it a little bit to one side or a little bit to the other, the animal can nearly always manage to save itself from a tumble.

Even if it does fall, however, it does not hurt itself, for the skin of the lower part of the body is very loose, and it is fastened for a little distance along the inner surface of each leg. So, when the animal falls from a height, it merely stretches out its limbs at right angles to its body—stretching out the loose skin, of course, with them—and so turns itself into a kind of open umbrella, just like the parachutes which are often sent down from balloons. And instead of tumbling headlong to the ground and being killed by the fall, it is buoyed up by the air and floats down comparatively slowly, so that it is not hurt in the least.

The squirrel feeds on nuts, acorns, beechnuts, bark, buds, and the young shoots of certain trees. But it is also very fond of fir-cones, which it nibbles right down to the core; and sometimes it will eat bird's eggs. In fact, this squirrel is, in the United States, one of the most dreaded foes of nesting birds, and they often attack it and chase it away from their homes. Early in the autumn it always lays up a store of provisions, hiding them away in a hole in a tree, or more often in several holes. Then, when a warmer day than usual rouses it from its long winter sleep, it goes off to its hoard and enjoys a hearty meal.

These pretty little animals generally go about in pairs, and the little ones are brought up in a warm cosy nest made of leaves and moss. It is placed either in the fork of a lofty branch or in a hole high up in a tree-trunk, and it is so perfectly made that rain never soaks through it, and the wind never blows it away.

THE GRAY SQUIRREL

"This," says Mr. Hornaday, "is the most prominent squirrel of Southern Canada, New England, and the Eastern and Southern States southward to Florida. It ranges westward to Minnesota, Kansas, and Texas. Above, its color is clean iron-gray, which in southern specimens is mixed with dull yellow. The lower surface is white, varying to yellowish brown. Usually it nests in hollow trees, but when crowded for room builds an open nest of green leaves, or shavings of cedar bark made into a round ball. The young are usually five in number. The gray squirrel frequently consents to live in city parks, and becomes quite tame. It spends much of its time upon the ground, searching for nuts, roots, or anything which can be eaten."

Here is a good place to repeat some other words of Mr. Hornaday's. "There is no other animal of equal size," he says, "that can add so much of life and cheerfulness to a hardwood forest or a meadow as a good healthy squirrel. *Why is it* that American men and boys kill them so eagerly? . . . Surely no true sportsman or right-minded boy can find any real 'sport' in 'potting' squirrels out of the tree-tops." And we might add that too often the desire to kill leads men and boys to destroy other kinds of innocent animals, instead of treating them as friends to be enjoyed, and whose right to live is just as good as that of human beings. Kindness toward harmless animals helps to make us kinder to each other.

FLYING SQUIRRELS

So-called flying squirrels are found in some parts of the world; but like the colugo, of which we have told already, they do not really fly. They merely skim from one tree to another by spreading out the very loose skin of the sides of the body and then leaping into the air. In this way they can travel for perhaps two or three hundred feet. But as a rule they merely spring from branch to branch, just like the common squirrel.

The largest and perhaps best known of these squirrels is the

taguan, which is found in India and Siam, and is about two feet in length, not including the tail. It is fairly abundant, but is not very often seen, for all day long it is fast asleep in a hole in some tree, only coming out of its retreat after sunset.

Several species of flying squirrels are found in North America, and often make their homes in garrets.

GROUND-SQUIRRELS

There are several squirrels that live upon the ground, and do not climb trees at all. The most famous of these is the chipmunk, or chipping squirrel, which is very common in many parts of North America. It is called chipmunk because, when it is excited or alarmed, it utters a sharp little cry like the word "chip-r-r-r," over and over again.

This is an extremely pretty little animal, its fur being brownish gray on the back and orange brown on the forehead and hind quarters, while a broad black stripe runs along the back, and a yellowish-white stripe edged with black along each side. The throat and lower part of the body are white.

The chipmunk lives in burrows which it digs in the ground, and very wonderful little burrows they are, seldom less than eight or nine feet long, with a large sleeping-chamber at the end, filled with moss and grass and dry leaves. Then on either side of the main burrow are several shorter ones which are used as larders, and in which large stores of provisions are packed away. From one chipmunk's nest have been taken nearly a peck of acorns, together with about a quart of beechnuts, two quarts of buckwheat, a few grains of corn, and a quantity of grass-seeds! Only three squirrels were found in this burrow; so that they were in no danger of starving during the winter, were they?

The beechnuts have very sharp points, and the chipmunk bites these carefully off before it attempts to pack the nuts away in its mouth. It carries four nuts to its burrow at a time, putting one into each of its odd cheek-pouches, which are very much like those of certain monkeys, and one into the mouth itself, while the fourth is held between the teeth.

The chipmunk is a very active little creature, and its quick.

jerky movements as it darts in and out among the herbage have often been compared to those of the wren.

PRAIRIE-DOGS

The prairie-dog, which is so called because it lives on the prairies of North America, and utters an odd little yelping cry which is something like the bark of a very small dog, has several other names as well, for sometimes it is known as the prairie-marmot, and sometimes as the wishtonwish. It is quite a small animal, being seldom more than twelve inches in length without counting the tail, and is reddish brown or brownish gray above, and yellowish or brownish white beneath. The tail is about four inches long.

In the great prairie-lands which lie to the east of the Rocky Mountains, this quaint little animal is exceedingly plentiful. It lives in underground burrows, and the earth which it digs out in making them is always piled up just outside the entrance in the form of a mound about two feet high, on the top of which it likes to sit upright, squatting on its hind quarters as a dog does when "begging." At the slightest alarm it utters its queer little yelping cry, throws a sort of half-somersault, and dives into its burrow, to reappear a few minutes later when it thinks the danger has passed away.

A large number of prairie-dogs always live together, like rabbits in a warren, and sometimes the prairie, as far as one can see, is dotted all over with their mounds. Usually the animals are steadily moving eastward. They increase as ranching and farming spread over the plains; for the cultivation of hay and grain and the destruction of their natural enemies favor them. In parts of Texas and northward they are so destructive that united means of destroying them by poison have been adopted.

It was formerly thought that prairie-dogs took in lodgers, so to speak, for small owls, known as burrowing owls, are often found in their tunnels, together with rattlesnakes; and it was supposed that all three lived peaceably together. But now we know that this is not the case, for the owls are nearly always

found in deserted burrows, while the rattlesnakes undoubtedly enter the homes of the prairie-dogs for the purpose of feeding upon their young.

MARMOTS

Not unlike a rather big prairie-dog is the common marmot, which is found in considerable numbers in the mountainous parts of Northern Europe and America. Here it is named whistler or siffleur. More familiarly known is the American woodchuck, or groundhog, which burrows deeply in the fields of almost every farm in the country. These marmots are famous for their winter sleep. During the summer months they are very active and busy. From about the middle of autumn till the beginning of spring, however, they are fast asleep in their burrows, not waking up at all for at least six months! Before entering upon this long slumber they pack their sleeping-chamber full of dry grass, and in these warm beds survive the winter by the slow absorption of their fat, so that when they come out they are very lean.

Another kind of marmot, called the bobac, is found both in Northern Europe and in Asia. It is sometimes eaten as food, but is most difficult to kill, for unless it is actually shot dead as it sits it will nearly always contrive to get back into its burrow. And if the animals are startled by the report of a gun they all disappear underground, and will not be seen again for several hours.

BEAVERS

One of the most interesting of all the rodent animals is the beaver, which is found in the northern parts of Europe, Asia, and America. It spends a great part of its life in the water, and no doubt you have heard of the wonderful dams which it makes in order to prevent the rivers from drying up during the summer months.

When the animals want to construct one of these dams, the first thing they do is to fell a number of trees which stand near the banks of the river. They do this by gnawing through the



TYPES OF RODENTS

1. European Hamster. 2. East Indian Striped Squirrel. 3. Woodchuck; Marmot.
 4. South American Capybara. 5. South American Vizcacha. 6. Beaver.

is so deep that even in the hardest winter the water in it never freezes quite to the bottom; and in this deep place they pile up a great quantity of logs and branches, so that in winter they may have as much bark as they require to eat.

Beavers are capital swimmers, for the toes of their hinder feet are joined together with webbing, and make excellent oars, while the broad, flat tail is very useful as a rudder. They are very much hunted, for their fur is valuable, while they also secrete a curious substance known as castor, or castoreum, which is used in medicine. So in some parts of North America these animals are strictly preserved, and only a certain number may be killed every third year.

THE DORMOUSE

Everybody knows what a sleepy little creature the dormouse is. Very often it may actually be picked up and handled without waking! It sleeps all day long, and hibernates from the middle of October till the beginning of April as well, so that it fully deserves its name of dormouse, or sleep-mouse. It is found in Europe and Asia, and sometimes in Africa.

In Germany it is called the Haselmaus, or hazel-mouse, because it is so fond of hazelnuts. It eats these just as the squirrel does, holding them in its fore paws as it sits upright on its hind quarters. But it also feeds upon acorns, beechnuts, hips and haws, and corn when it can get it.

Dormice always make two nests during the year, one being used during the summer, and the other during the winter. They are very warm and cosy little retreats, about six inches in diameter, and are made of grass, leaves, and moss. Sometimes numbers of the summer's nests are found in thick bushes, or among the low herbage at the bottom of a hedge, perhaps with the dormice fast asleep in them. But the winter nests are generally more carefully hidden, so that it is not very easy to find them even when the leaves are off the bushes.

Before it goes into hibernation in the autumn, the dormouse becomes very fat. But it does not sleep right through the winter without taking any food, for on very mild days it wakes

up for an hour or two, and eats one of the nuts or acorns which it has carefully stored away in its nest.

JERBOAS

The jerboa is an extremely curious animal, and if you were to see it in the sandy deserts of the Old World, where it is found, you would be very likely to mistake it for a small bird. For it has very short fore legs, which it tucks up against its breast in such a way that they can hardly be seen, and very long hind ones, on which it hops about in a very bird-like manner. But you would soon notice that it has a long tail, rather like that of a mouse, but which has a tuft of hairs at the tip. When it is leaping about it stretches this tail out behind it, and seems to find it of very great use in keeping its balance.

Jerboas are very common in Egypt and other parts of North Africa, and live in burrows which they dig in the sandy soil. In order to enable them to obtain a firm foothold on the slippery sand, the soles of their feet are covered with long hairs, which also prevent them from being scorched by contact with the heated ground. But as a rule they do not come out of their burrows until the evening, when the sun is not so powerful as it is during the middle of the day. They feed upon grasses and dry shrubs; but how they find enough to eat in the desert places in which they live is rather hard to understand.

Many different kinds of jerboas are known. The best known, the common jerboa, is about as big as a small rat, and has a tail about eight inches long. In color it is so much like the sand that from a few yards away it is almost impossible to see it, even when it is skipping about.

THE HAMSTER

This is a queer little rodent which is found very plentifully in Germany, and also in many districts between that country and Siberia. It is a rather stoutly built animal, and measures nearly a foot in length including the tail, which is about two inches long. In color it is generally light brownish yellow

above and black beneath, with a black stripe on the forehead, a yellow patch on the back, and white feet. But hamsters are by no means all alike, and some are entirely black, some pied, and some entirely white.

You remember how dormice make summer and winter nests. In the same way, European hamsters make summer and winter burrows. The summer burrow is quite a small one, not more than a foot or two deep, with a small sleeping-chamber at the bottom. But the winter one is very much larger, for it is not only six feet long at least, with quite a big sleeping-chamber, but there are from one to five side chambers as well, which are used as granaries. In these the animal stores up vast quantities of grain, peas, and beans, as many as sixty pounds of corn having been taken from the burrow of a single hamster, and a hundredweight of beans from that of another. About the middle of October it stops up the entrances to its home, and passes into a state of hibernation, in which it remains till the beginning of March. For about a month longer it still remains in its burrow, feeding on its stores and provisions, till early in April it resumes its active life, and returns to its summer habitation.

Of course hamsters are terribly destructive in cultivated land, and large numbers are destroyed every year. In one district alone nearly a hundred thousand have been killed in a single season, while an enormous quantity of grain was recovered from their tunnels.

WATER-VOLES

If you walk along the bank of a stream in some European country, you may often hear a splash, and see a brownish animal about eight inches long swimming away through the water. This is a water-vole, often called water-rat, although it belongs to quite a different family from that of the true rats. And if one looks down the side of the bank he will see its burrow, which generally runs into the ground for some little distance.

Water-voles are usually supposed to be mischievous; but during the greater part of the year they feed only on water-plants, being specially fond of the sweet pith of the wild flags. In winter, however, when food of this kind is scarce, they will

nibble away the bark of small trees and shrubs, and sometimes do a good deal of damage in osier-beds, while they will also visit cultivated fields in order to feed on vegetables.

The water-vole is a very good swimmer, although its toes are not webbed, and its fur is so close and so glossy that it throws off the water just like the feathers on a duck's back.

A near relation of the water-vole is the field-vole, or field-mouse, also called meadow-mouse, which is found very commonly in most parts of Europe, and also in North and South America. It is about as big as an ordinary mouse, and is grayish brown in color, which becomes rather paler on the lower parts of the body.

This animal is found chiefly in meadows, where it makes long runs beneath the grass, and also burrows into the ground. It is always plentiful, and sometimes appears in such vast numbers that it can only be described as a plague.

The muskrat, which is one of the most widely distributed and important of American fur-bearing animals, is really a sort of big aquatic vole.

LEMMINGS

Still more mischievous, in Norway and Sweden, are the odd little rodents known as lemmings, which make their appearance from time to time literally in millions. They always seem to come down from the mountains, and when once they have begun their journey nothing will stop them. If they come to a river they swim across it; if to a house, they climb over it; if to a stack of corn or hay, they eat their way through it. Large numbers of wolves, foxes, weasels, stoats, hawks, and owls soon discover the swarm, and kill off the animals in thousands; but still the great army moves steadily on, leaving the country perfectly bare behind it, until it reaches the sea. And then those behind push on those in front, till almost the whole vast host perish in the waves.

These great migrations take place, as a rule, about once in seven years, and no one seems to know quite where the lemmings come from, or why they travel in this singular manner.

These strange little animals do not seem to know what fear is,

for if a passer-by happens to meet one of them it will never turn aside, but will sit up and yelp defiantly at him, while if a dog goes up and examines it, the chances are that it will try to bite his nose!

In color the European lemming is blackish brown above and yellowish white below, while its length is about six inches.

Various kinds of rodents known as lemmings are found in North America. The Hudson Bay lemming has a thick, warm fur. Eskimo children use lemming-skins to make clothes for their dolls.

RATS

The brown rat and the black rat, of course, are only too common everywhere. They seem to have come in the first place from Asia, and have spread to almost all parts of the world. For almost every ship that sails the sea is infested with rats, some of which are nearly certain to make their way ashore at every port at which she touches.

Rats are rather formidable animals, for besides being very savage, a number of them will often combine together in order to attack a common foe. We have known a large cat, for example, to be so severely wounded by rats, that after lying in great pain for two or three days it actually died of its injuries. Rats are very bloodthirsty creatures, for if one of their own number is caught in a trap, they will tear it in pieces and devour it. They will enter fowl-houses at night, and kill the birds as they roost upon their perches, while if they can find their way into a rabbit-hutch they will even destroy the rabbits.

In barns and farmyards rats are very mischievous, and corn-stacks are often infested by them. How often they get into houses you know too well! But on the other hand, they often do a great deal of good, by devouring substances which would otherwise decay and poison the air; so that they are not altogether without their uses, as people annoyed by them are too apt to suppose.

Rats generally have three broods of little ones in the course of the year, and as there are from eight to fourteen in each brood,

you can easily understand how it is that these animals multiply so rapidly.

MICE

Still more plentiful, and almost as mischievous, is the common mouse, which is found both in town and country. And this, too, seems to have been in the first place a native of Asia, and to have since spread to almost all parts of the world.

There is no need, of course, to describe its appearance, and most of us are familiar with its habits. So we will pass on at once to one of its near relations which is not quite so well known, namely, the long-tailed field-mouse.

In some respects this animal is very much like the field-vole. But you can tell it at once by its more pointed muzzle, by its much larger ears, and, above all, by its very much longer tail. It lives in gardens, fields, and hedgerows, but often takes shelter in houses and barns during the winter. But all through the spring, summer, and autumn it occupies burrows in the ground, and very often it lays up quite large quantities of provisions in its tunnels for winter use, just as the hamster does in Germany. It does not always dig these burrows for itself, however, for very often it will take possession of the deserted run of a mole, or even of a natural hollow beneath the spreading roots of a tree.

As a general rule, this little animal is a vegetable-eater only. But when food is scarce it will kill and devour small animals, and has even been known to prey upon its own kind.

The pretty little harvest-mouse is the smallest of the European rodents. A full-grown harvest-mouse is seldom more than four and a half inches long, of which almost one half is occupied by the tail. And it would take six of the little creatures to weigh an ounce.

The harvest-mouse is not found, as a rule, near human habitations, but lives in corn-fields and pastures. But sometimes it is carried home in sheaves of corn at harvest-time, and in that case it lives in the ricks during the winter. Generally, however, it spends the winter months fast asleep in a burrow in the ground. Then, when the warm months of spring come round, it wakes up, and sets about building a most beautiful little nest of grasses

and leaves, which it always suspends among corn-stalks or grass-stems at some little height from the ground. This nest is about as large as a baseball, and the odd thing about it is that you can never find any entrance! Apparently, when the little builder wishes to go in and out, it pushes its way between the strips of grass of which the nest is composed, and then carefully arranges them again in position. And it is so cleverly built that when eight or nine little mice which are brought up inside it begin to grow, it stretches to suit their increasing size, so that their nursery is always just big enough to contain them.

The harvest-mouse is a capital climber, and runs up and down the corn-stalks with great activity, even though they bend nearly to the ground under its weight. The tip of its tail, strange to say, is prehensile, just like that of a spider-monkey.

PORCUPINES

Of course you know what a porcupine is like, with its coat of long, bristling spines. Indeed, the word porcupine means spiny pig, and refers partly to the quill-like spikes, and partly to the odd grunting noise which the animal utters from time to time.

There are several different kinds of porcupine in the Old World and in America. The common porcupine is found in the south of Europe, and also in the northern and western parts of Africa, and grows to a length of about two feet four inches, not including the tail. The quills are of two kinds. First of all, there are a number of long, slender spines, which bend quite easily, and are not of very much use as weapons. But under these is a close array of very much stiffer ones from five to ten inches long; and these are very formidable indeed. For they are so loosely fastened to the skin that when the animal backs upon a foe a good many of them are sure to be left sticking in its flesh; while, further, they are made in such a manner that they keep on boring their way farther and farther in, and in course of time may penetrate a vital organ, and cause death. Even tigers have sometimes lost their lives through the quills of a porcupine which they had been trying to kill and devour. The animal is not at all fond of fighting, however, and never attacks unless it is provoked.

During the daytime the porcupine is seldom seen, being fast asleep in its burrow. But soon after sunset it leaves its retreat, and wanders to long distances in search of the roots, bark, etc., upon which it feeds. "In the woods, it loves to prowls around camps and eat every scrap of leather or greasy board it can find."

In North America is found the Canada porcupine, ranging from New England westward to Ohio and northward to Hudson Bay. Another species in the West and Northwest is the yellow-haired porcupine. In Mexico, Central America, and South America are other species known as tree-porcupines.

It has been widely supposed that porcupines shoot their quills, but this belief has no foundation. When attacked, Mr. Hornaday tells us, its defence consists in erecting its quills and striking quickly a strong sidewise blow with the tail, which often drives many quills into its enemy.

THE CHINCHILLA

This pretty little rodent is famous for its beautiful silky fur, which is in much request for women's garments. In appearance it is rather like a large dormouse, with very big rounded ears, and a short, hairy tail. It is found in Bolivia, Chile, and Peru, and lives high up among the mountains in burrows in the ground. A large number of the animals always dwell together, so that their burrows form a kind of large warren, and they dart up and down the steep rocks with such wonderful speed that it is almost impossible to follow their movements.

When it is feeding the chinchilla sits upright, like a squirrel, and conveys the food to its mouth with its fore paws. It lives chiefly upon roots, and as the districts in which it lives are so wild and barren it often has to travel for long distances in order to obtain them.

THE VISCACHA

Closely related to the chinchilla is the viscacha, which is found very abundantly in the great pampas districts of South America. It generally lives in little colonies of from twenty to thirty ani-

mals, which dig their burrows close together, and heap up the earth which they scrape out into one common mound. These burrows are generally dug in the form of the letter Y, and often a number of them communicate with one another by means of short passages, so that if the little animals feel in want of society they can easily go and see their friends.

These colonies are called viscacheras, and in some parts of the Argentine Republic the plains are closely studded with them as far as the eye can reach.

Viscachas have a curious way of clearing off all the vegetation that grows near their burrows, and piling up the refuse in a mound near the entrance. They will also collect together any hard objects which they may happen to find, and we are told by Darwin that sometimes quite a barrow-load of bones, stones, thistle-stalks, and lumps of earth may be found outside the entrance to a single burrow, and that a traveler who dropped his watch one evening found it next day by searching the viscachamounds in the neighborhood.

In appearance the viscacha is not unlike a rather small marmot; but the fur is gray above, with dusky markings, and white below, while the face is crossed by two black bands, with a broad white stripe between them.

THE AGOUTI

This animal, found in South America and the West Indies, was formerly very plentiful—in some parts literally swarming. But it did so much mischief in cultivated ground that it was trapped and shot in immense numbers, and it has now almost entirely disappeared from many districts in which it once abounded.

The first point that strikes one on looking at the agouti is the great length of its hind legs. So long are these limbs, that the animal finds a good deal of difficulty in running downhill, and often tumbles head over heels and rolls for several yards before it can recover its footing. And for the same reason, when it is running at any pace on level ground, it travels along by a kind of gallop, which is really made up of a series of leaps.

As the agouti comes out only by night it is a difficult animal to watch, and it is so wary that it cannot be approached without great caution. All the time while it is feeding, it keeps on turning its head first to one side and then to the other, so that it can scarcely ever be taken by surprise.

If it should be captured, however, it never seems to fight, and has no idea of using either its sharp teeth or its claws to defend itself. So sometimes it has been thought that an agouti would make a very nice pet. Those who have allowed it to run loose in the house, however, have seldom repeated the experiment, for it will ruin any article of furniture in a very short time, and will cut its way through the stoutest door in a few minutes!

When fully grown, the agouti is rather more than eighteen inches long, and in general color it is olive brown. But the hair of the hinder quarters, which is very much longer than that of the rest of the body, is golden brown, while the middle line of the lower part of the body is almost white.

THE CAPYBARA

Few people, on seeing a capybara for the first time, would take it to be a rodent. It looks much more like a wild pig, for it has a very heavily built body, which almost touches the ground as it waddles along, short, stiff, bristly hair, and great hoof-like feet. Indeed, it is sometimes called the water-hog. Yet we only have to look at its front teeth to see that it really is a rodent after all.

The capybara is a native of South America, and is generally found in the damp, marshy ground near the banks of the larger rivers. It is a good swimmer, and always makes for the water when alarmed. It is a good diver, too, and can easily remain below the surface for seven or eight minutes without requiring to breathe, so that if it can once plunge into the river it is safe from almost any foe. When fully grown, the capybara is about four feet long, and weighs nearly one hundred pounds. In fact, it is the largest of all the rodent animals. In color it is reddish brown above, and brownish yellow beneath, and it is further remarkable for having no tail at all.

HARES AND RABBITS

The hares and rabbits, of which our account is taken from "The Life of Mammals," by Ernest Ingersoll, form a compact family of some sixty species, scattered in all divisions of the globe except Australasia and Madagascar; but only one species occurs in South America, and the family is most numerous in northerly regions, where these animals form an important food resource for man and beast. All are much alike in the long, high-haunched hind legs, which give great leaping and dodging power; tall, erectile ears; divided upper lip; short scut; and grizzled gray-brown coat, with various specific markings of white and black. The only exceptional one is the "hispid" hare of Northeastern India, which has small eyes, bristly short ears, short hind legs, and much the manner of a rabbit.

The term rabbit has wholly replaced "hare" in America, because the common small hare of the eastern United States, quickly seen by the first English settlers, looked to them more like the rabbit they had known at home than like their bigger hare; and they ignored the difference in habits as they did so many other facts in their careless naming of the animals of the New World after those of Europe. It must always be remembered that the first Pilgrims, Puritans, and southern "adventurers" were mainly from cities, and knew little of rural things, to which ignorance, by the way, they owed most of their early misfortunes in the colonies.

The true rabbit, or cony, differs from its relatives by its small size (average weight two and a half to three pounds), short ears and hind legs; but more in its habits, for its young are born naked, blind, and helpless, and it is comparatively slow-footed. Hence it has been compelled to become a burrower for the safety of both itself and its babies, and, as is usual with animals become burrowers, has acquired the habit of gathering in communities, whose crowded diggings, or warrens, are labyrinths of subterranean runways. Even this, however, would hardly suffice to preserve this timid and nearly defenceless race were not several litters of five to eight young

(leverets) produced by each pair annually to make good the loss from enemies and disease. The original European wild rabbit is grayish brown, becoming foxy on the neck, but this rabbit has been domesticated since ancient times, and alterations of coloring as well as of form have been produced. Ten or more distinct breeds are recognized by fanciers, some of which, as the lop-eared, the great Belgian, and the Angora, are far away from the original type.

Their amazing fecundity has caused rabbits to multiply into an almost uncontrollable pest since they were unwisely introduced into Australia and New Zealand, where the scarcity of beasts of prey allowed them to increase without bounds. In a few years, therefore, the whole country was overrun by millions, which threatened to devour not only all the crops but every bit of wild herbage; even in Europe, when for any reason their subjection is neglected, they do great damage to gardens, orchards, and plantations of young trees.

At present further use is being made of the rabbits by "packing" their edible flesh in various forms as an article of preserved food, which is finding a wide market; and probably the pest will be abated in course of time by natural processes.

Returning to the hares, not much need be said as to particular species. All dwell either in open grassy country or else among rocks and bushes. They do not flock, nor make any sort of shelter, but each inhabits a certain small district, where it makes a smooth resting-place called its form. To this it will return day after day for a long time unless frightened; and in such a form the young are born and are left concealed, when still in the suckling age, under a cover of leaves and vines, or even fur plucked by the mother from her own loose coat and felted into a sort of blanket. They seek no better shelter than this in winter, except that some, as our common little cottontail, will creep into the mouth of an old skunk's or woodchuck's hole or within a hollow stump, to seek protection from the "cauld blast." The "jacks" of the Plains are so well furred that even the soles of their feet are warm mats of hair; and they are the only small animals able to survive outside of burrows the intense winter cold and gales of those bleak uplands. This

hardihood is due primarily, of course, to the fact that hares are able to find nutritious forage all through the winter, and so keep up their bodily heat.

All species have great speed—their principal means of safety—and the swiftest hounds are hardly able to run them down; while they also have astonishing skill in suddenly halting and turning, or doubling, by which they gain a fresh start before their more clumsy pursuers can perceive what has happened, and change their course. Chasing them with greyhounds is a regular sport called coursing. Along with this goes extreme timidity and watchfulness, in which their big ears serve a most useful purpose, rising to the slightest sound, but dropping out of the way as the animal makes off in a series of tremendous leaps; and the hare can make faster time uphill than down, owing to the greater length of the hind legs—a decided advantage. Knowing these tricks, most of its enemies resort to counter-strategy—a stealthy approach and quick rush—and an excellent picture of these wiles, and poor Bunny's efforts to meet them, may be read in Seton's tale of "Raggylug," and in such delightful writings as those of Audubon and Bachman, Godman, Kennicott, Lockwood, Abbott, Robinson, Sharp, Cram, and some others. Even the least of the tribe, however, is able to make a defense which often completely disconcerts the foe, and the means are found in its strong hind feet.

In addition to this familiar eastern cottontail we have in the United States several other species, as the little marsh-hare and the big water-hare of the Southern States; the large northern varying hare; the arctic hares; the various long-eared, long-legged "jack rabbits" of the Plains and Rocky Mountains; and several lesser species, more or less common on the Pacific coast. The varying hare is so called because, as is the case with several foreign northern hares, its brown summer coat when shed as usual on the approach of winter is replaced by one which is white.

CHAPTER XV

THE WILD OXEN

WE now come to a very important group of mammals called ungulates, or hoofed animals, because of the way in which their feet are formed. The oxen, sheep, goats, antelopes, deer, horses, swine, elephants, and rhinoceroses all belong to this order. First let us notice some of the wild oxen.

THE GAUR

The largest of these is the Gaur, which is found in India. It is a very big animal, sometimes standing more than six feet in height at the shoulder, and as it has long and very powerful horns, it is much dreaded by the natives. As a rule, however, it is a very gentle and peaceable animal, scarcely ever venturing to attack man, and only dwelling in those remote parts of the jungle to which even hunters seldom find their way.

The gaur lives in small herds, generally of from ten to twenty in number. Each of these is led by an old bull, and there are generally two or three younger ones, the rest being cows and calves. When the younger bulls grow up they usually fight the old one in order to take his place. For some time he contrives to hold his own; but when at last he is beaten he goes off and lives in the thickets by himself.

These solitaires, as they are called, are generally very savage, and will often rush out and attack a passer-by, even when he has not provoked them at all.

The gaur is a very wary animal, and sentries are always posted near the herd, in order to give warning of the approach of a foe. When feeding, they are said to stand in a circle with their heads outward, so that they can see in every direction.

The old male gaurs are nearly black in color, and the younger ones and the cows reddish brown, while they all have white "stockings" from the knee downward.

THE YAK

The yak, which lives in Tibet, is something like an ox with great masses of hair on its flanks, limbs, and tail. In color it is blackish brown, with a little white upon the muzzle, and in height is about five feet six inches at the shoulder. The thick fringes of hair do not begin to grow till it is about three months old, and the young calf is covered all over with curly black hair, like a Newfoundland dog.

The yak lives among the mountains, sometimes climbing to a height of fully twenty thousand feet, and scrambles about among the boulders with wonderful activity. Large herds of these animals, however, have been domesticated, and are used as beasts of burden, while their flesh is said to be almost as tender and well-flavored as beef. The big, tufted tail, too, is highly valued, for it is dyed in various colors, and is then employed in making the fly-flappers which are used so much in Eastern countries for driving away flies.

THE BISON

The famous bison, commonly called buffalo, of North America, sad to say is now almost extinct, for there are only a few small herds living under special protection. Yet, not so very many years ago, these magnificent animals wandered over the prairies in millions. Even a single herd, sometimes, would extend farther than the eye could reach, and we read of one herd which covered a tract of country fifty miles long and twenty-five miles broad! But these herds were recklessly destroyed for the sake of their hides and tongues, and now there are only a few wild buffaloes left alive altogether.

Generally, however, buffaloes are to be seen in zoos, and if you go to look at them you will most likely think that the male looks rather like a very big lion. For it has an enormous mane of long, shaggy hair, which covers the head and shoulders. There is also a sort of long beard under the chin, and the hair of the sides and hind quarters is very thick. The consequence



FOUR TYPES OF CATTLE.

1. American Bison.
3. Thibetan Yak.

2. Hindu Humped Ox.
4. Asiatic Water Buffalo.

is that the animal looks a great deal bigger than it really is, although it stands well over five feet high at the shoulders.

In spite of its great mass of hair, this is a very active animal, and it can both trot and gallop with considerable speed. When galloping it always holds its head close to the ground, and its tail high up in the air. It is not by any means a courageous animal, notwithstanding its size and strength. But the bulls fight most savagely with one another, roaring so loudly that in the days of the great herds the noise was compared to thunder, and could be heard for miles.

Another kind of bison, called the aurochs, lives in the great forests of Northern Europe. Its mane is not so long and thick as that of the American animal, but its horns are longer and not so strongly curved.

THE CAPE BUFFALO

Smaller than the bison, but very much more formidable, is the cape buffalo, which is spread over almost the whole of Africa south of the equator. It is about as big as an ordinary bullock, and has a pair of massive and sharply pointed curved horns, which are sometimes as much as three feet in length.

This animal lives in reedy swamps, and is generally found in herds, which often number from 250 to 300 individuals. They are very wary, and difficult to approach, while they are so swift of foot that only a very fast horse can escape from them when carrying a rider on its back. In charging they throw their heads back, with the horns upon the shoulders, and then suddenly bend down and strike upward when they come within reach.

The buffalo does not usually attack unless it is wounded, however, though solitaries will often lie in concealment and rush out upon the hunter as he passes by.

THE INDIAN BUFFALO

There is another kind of buffalo found in India, which is a very different animal in every way. It is different in appear-

ance, for it has its head drawn out into a kind of muzzle, while its horns are very long indeed, and taper gradually from base to tip, at the same time curving outward and upward and backward. And it is different in disposition, because it is easily tamed, and is employed in many parts of India as a beast of draught and burden. You might see buffaloes drawing a plow, for example, or dragging a cart, and for these and similar purposes they have been introduced into Egypt, and even into Southern Europe. The wild bulls, however, are apt to be very savage when they live alone. But a herd of buffaloes, strange to say, though they will gallop up close, and toss their heads, and behave in a most threatening manner, seem never to actually attack a man so long as he has the courage to stand perfectly still.

THE MUSK-OX

Though it is called an ox, and looks like an ox, this animal is in reality much more closely related to the sheep. It is of about the size of a rather large ram, but looks much bigger than it really is, owing to the great masses of long hair, which cover the whole of its body, and hang down so far that one can scarcely see its legs at all. It is even more hairy than the yak.

The horns of the male animal are very curiously formed, for they are so broad and flat at the base that they form a kind of helmet, which covers almost the whole of the forehead. They then droop downward on either side of the face, but curve upward and outward at the tips. Those of the cow, however, are very much smaller.

The musk-ox lives in the most northerly parts of North America. It is perfectly at home amid the snow and ice, and lives in the wildest and dreariest regions, in which the ground scarcely thaws during the whole of the year; so that the life of those who hunt it is a very hard one. But, as a rule, its only enemies are the arctic wolves, which drive it to bay on some rocky mountain slope, and tear it to the ground by the mere force of numbers.

The name of this animal is due to the musky flavor of its flesh, which is said to be very tender and delicate.

SHEEP

The sheep are represented at the present time by several wild species, one of which is found in Northern India east of the Indus, in the Punjab, and in Sind; one in North America; and another in North Africa. The rest inhabit the high ground of Europe and Asia as far south as the Himalayas. These mountains, with the adjacent plateaus of the Pamirs and the great ranges of Central Asia, form the main home of the group. Wild sheep are of various types, some so much like the goats that it is difficult to draw a hard and fast line between them; while others, especially the curly-horned argalis, bighorns, urial, and Kamchatka wild sheep, are unmistakably of the sheep type.

The wild original of the domesticated breeds of sheep is unknown. Domesticated sheep which live on hills and mountains are still inclined to seek the highest ground at night. The rams fight as the wild rams do, and many of them display activity and powers of climbing and of finding a living on barren ground scarcely less remarkable than in the wild races.

The domesticated sheep have been bred by artificial selection for unnumbered ages in order to produce wool. It is said that in some of the wild breeds there is an under-fur which will felt like wool. Most of the species are short-tailed animals, but this is not the case with the Barbary wild sheep. Wild sheep are mainly mountain-living animals or frequenters of high ground. They generally, though not always, frequent less rugged country than that of the wild goats, and some are found at quite low levels. The altitude at which other wild sheep are found is, however, very great; on the Pamirs it reaches twenty thousand feet. Here the country is quite open.

THE EUROPEAN MOUFLON

The only wild sheep of Europe is the mouflon, found in the mountains of Corsica and Sardinia. Its height at the shoulder is about twenty-seven inches. In the rams the horns are strong, and curved into a spiral, forming almost a complete circle. The hair is close, and in winter has a woolly under-fur. In summer

and autumn the coat is a bright red brown on the neck, shoulders, and legs; the rump and under parts are whitish, and the back and flanks marked with a white saddle. In winter the brown becomes darker and the white saddle broader. A rather larger mouflon is found on the Elburz mountain range in Persia, in Armenia, and in the Taurus Mountains. A smaller variety exists in Cyprus, where it has been preserved since the British occupation. The mouflon is a typical wild sheep. In Sardinia and Corsica are dense scrubby forests of tall heather, some five feet high, practically impenetrable to hunters. When alarmed, the mouflon dash into this cover and are safe. These forests have preserved two very interesting survivals of antiquity—the mouflon, and the Corsican or Sardinian bandit. The Corsican bandit, like the mouflon of the same island, is nearly extinct. In Sardinia both still flourish.

THE ARGALI

This animal is found in Siberia and Mongolia, and also in Tibet. It is the largest of all living wild sheep, and is about as big as a large donkey, and has enormous twisted and wrinkled horns, which are sometimes as much as four feet long, and nineteen inches round at the base. The male Tibetan argali has a ruff on the throat. The usual color is a stony gray, mingled with white in summer in the case of the old males.

The argali rams are very fond of fighting one another, and such fierce conflicts take place that sometimes their horns are broken short off, and left lying upon the ground. And it will give you some idea of the size of these horns when we tell you that more than once a fox has been found lying fast asleep in one of them!

The argali is a mountain-loving animal, seldom seen at a lower level than twelve or thirteen thousand feet even in winter, while in summer it ascends much higher. It is a most difficult creature to approach, for it lives in small flocks, which always post a sentry to keep careful watch while they are feeding. At the slightest sign of danger the alert sentinel gives the alarm and a moment later the animals are dispersing in all directions,

scrambling so actively over rocks and up and down precipices that is it quite impossible to follow them.

It has sometimes been said that when the argali leaps from a height it alights on its horns, which break the force of its fall. But this statement seems to be quite untrue.

Writing of the argali of Southern Siberia, the naturalist Brehm says that when the Tartars want mutton an argali-hunt is organized. The Tartar hunters advance on their horses at intervals of 200 or 300 yards, and when the sheep are started generally manage, by riding, shooting, coursing them with dogs, and shouting, to bewilder, shoot, or capture several.

THE GULJAR, OR MARCO POLO'S SHEEP

On the high plateau of the Pamirs and the adjacent districts Marco Polo's sheep is found. The rams are only slightly less in size than the Siberian argali; the hair is longer than in that species, and the horns are thinner and more slender and extend farther in an outward direction. An adult ram may weigh three hundred pounds. The first description of this sheep was given by the old traveler whose name it now bears. He said that on the Pamir plateau wild animals were met with in large numbers, particularly a sheep of great size, having horns three, four, and even six palms in length; and that the shepherds (hunters?) formed ladles and vessels from them. In the Pamirs Marco Polo's sheep is seldom found at less than 11,000 or 12,000 feet above the sea. In the Tian-Shan Mountains it is said to descend to 2,000 or 3,000 feet. They prefer the hilly, grassy plains, and only seek the hills for safety. On the Pamirs they are said to be very numerous in places, one hunter stating that he saw in one day not less than six hundred head.

THE BIGHORN SHEEP OF AMERICA AND KAMCHATKA

North America has its parallel to the argalis in the famous bighorn. It is now very rare even in Northern Canada, and

becoming scarce in the United States, though a few are found here and there at various points on the Rocky Mountains as far south as Mexico. In habits it is much the same as other wild sheep—that is to say, it haunts the rock-hills and “bad lands” near the mountains, feeding on the scanty herbage of the high ground, and not descending unless driven down by snow.

The bighorn sheep are very partial to salt. Mr. Turner, who hunted them in British Columbia, says: “Wild sheep make periodical excursions to the mountain-tops to gorge themselves with salty clay. They may remain from an hour to two days, and when killed their stomachs will be found full of nothing but the clay formed from denuded limestone, which they lick and gnaw until sometimes deep tunnels are formed in the cliffs, large enough to hide six or seven sheep. The hunter, standing over one of these warrens, may bolt them within two yards of him. In the dead of winter sheep often come to the woods to feed on fir-trees. At such times they may be seen mixed with black-and-white-tailed deer, low on a river-bank. I have known them come within forty yards of an inhabited hut.”

Mr. H. C. Nelson tells us that once he was sleeping with two other friends in a hut in the mountains where some miners had lived for a time. These men, when they washed up their pots and pans, threw the slops away at a certain place close by the hut. As all water used for cooking meat has salt put into it, a little salt remained on the surface. This the wild sheep had found out, and were in the habit of coming to lick it at night.

The bighorn sheep stands from three feet two inches to three feet six inches at the shoulder. The horns are of the general type of the argalis, but smoother. Another bighorn is found in Kamchatka. There is also a beautiful white race of bighorn inhabiting Alaska. The typical Rocky Mountain race is browner than the Asiatic argalis, and in winter is dark even beneath the front parts of the body. It is not found on the high peaks of the great ranges, but on difficult though lower ground on the minor hills.



1. Chamois.
2. Mouflon.

WILD SHEEP AND GOATS

3. Argali.
4. Markhor.

THE URIAL

The vast range of the Himalayas affords feeding-ground to other species of wild sheep and wild goat, so different in the shape of the horns that the variations of the sheep race under domestication need not be matter for wonder when so much variety is seen in nature.

The urial, or sha, is found in Northwest India, on the Trans-Indus Mountains, and in Ladak, Northern Tibet, Afghanistan, Baluchistan, Turkestan, and Southern Persia. The horns make a half-curve backward, and are flattened. The angle with the horizontal line across the ears is about half a right angle. The coat is of a reddish-gray color, with white on the belly, legs, and throat. This species has a very wide geographical distribution, and is the only wild sheep found in India proper.

THE AOUDAD, OR ARUI

This is a large wild type of the North African highlands. It stands intermediate between sheep and goats. The old rams have a very fine appearance, with a long flowing beard or mane, and large horns. These wild animals, though somewhat goat-like in appearance, are typical of the sheep race in general habits. They live in the Atlas Range, and in the splendid heights of the Aures Mountains, which lie at the back of Algeria and fringe the great Sahara Desert. In the isolated and burning rocks which jut up in the desert itself into single mountains they are also found, living on ground which seems absolutely destitute of water, grass, or vegetation. They live singly or in small families; but the rams keep mainly alone. Sometimes they lie in shallow caves during the heat of the day. These caves smell like a sheepfold. More generally the aoudad reposes on some shelf of rock, where it matches the color of the stone, and is almost invisible. The ground is one of the most difficult in which any hunting is attempted, except perhaps in chamois-stalking; but the pursuit seems to fascinate sportsmen.

Mr. A. E. Pease gives some charming descriptions of the

silence, the rugged rocks, and the astonishing views over the great orange Sahara Desert seen from the tops of these haunts of the aoudad—mountains on the summits of which his Arab guides would prostrate themselves in evening prayer as the sun sank over the desert, and then, rising, once more resume the chase. The young of the aoudad are charming little creatures, much like reddish kids. They can follow the mother over the steepest ground at a great pace. When caught, as they sometimes are by the Arabs, they soon become tame.

THE GOATS

Though the dividing-line between the sheep and goats is very indistinct, some differences are of general application. The goats are distinguished by the unpleasant odor of the males, and by beards on the chins of the same sex, by the absence of glands in the hind feet, which sheep possess, and by certain variations in the formation of the skull. The difference between the temperament of the sheep and goats is very curious and persistent, showing itself in a marked way, which affects their use in domestication to such a degree that the keeping of one or the other often marks the owners as possessors of different degrees of civilization. Goats are restless, curious, adventurous, and so active that they cannot be kept in enclosed fields. For this reason they are not bred in any numbers in lands where agriculture is practised on modern principles; they are too enterprising and too destructive. Consequently the goat is usually only seen in large flocks on mountain pastures and rocky, uncultivated ground, where the flocks are taken out to feed by the children.

On the high alps, in Greece, on the Apennines, and in Palestine the goat is a valuable domestic animal. The milk, butter, and cheese, and also the flesh of the kids, are in great esteem. But wherever the land is enclosed, and high cultivation attempted, the goat is banished, and the more docile and controllable sheep takes its place. In Syria the goat is perhaps more docile and better understood as a dairy animal than elsewhere in the East. The flocks are driven into Damascus in the morning;



GOATS AND GOAT-ANTELOPES.

1. Asiatic Tahr.
2. Alpine Ibex.

3. Rocky Mountain White Goat.
4. African Aoudad.
5. Arctic Musk-Ox.

and instead of a milk-cart calling, the flock itself goes round the city, and particular goats are milked before the doors of regular customers.

The European goat is a very useful animal for providing milk to poor families in large towns. The sheep, while preserving its hardy habits in some districts, adapts itself to richer food, and acquires the habits as well as the digestion of domestication. The goat remains, as in old days, the enemy of trees, inquisitive, omnivorous, pugnacious. It is unsuited for the settled life of the farm. Rich pasture makes it ill, and a good clay soil, on which cattle grow fat, kills it. But it is far from being disqualified for the service of some forms of modern civilization by the survival of primitive habits. Though it cannot live comfortably in the smiling pastures of the low country, it is perfectly willing to exchange the rocks of the mountain for a stable-yard in town. Its love for stony places is amply satisfied by a granite pavement, and it has been ascertained that goats fed in stalls and allowed to wander in paved courts and yards live longer and enjoy better health than those tethered even on light pastures. In parts of New York the city goats are said to flourish on the paste-daubed paper of the advertisements which they nibble from the bill-boards!

It is beyond doubt that these hardy creatures are exactly suited for living in large towns; an environment of bricks and mortar and paving-stones suits them. Their spirits rise in proportion to what we should deem the depressing nature of their surroundings. They love to be tethered in places where they find bushes to nibble. A deserted brick-field, with plenty of broken drain-tiles, rubbish-heaps, and weeds, pleases them still better. Almost any kind of food seems to suit them. Not even the pig has so varied a diet as the goat; it consumes and converts into milk not only great quantities of garden stuff which would otherwise be wasted, but also, thanks to its love for eating twigs and shoots, it enjoys the prunings and loppings of bushes and trees. In the Mont Dore district of France the goats are fed on oatmeal porridge. With this diet, and plenty of salt, the animals are scarcely ever ill, and never suffer from tuberculosis; they will often give ten times their own weight of milk in a year.

The Kashmir shawls are made of the finest goats' hair. Most of this very soft hair is obtained from the under-fur of goats kept in Tibet, and by the Kirghiz in Central Asia. Only a small quantity, averaging three ounces, is produced yearly by each animal. The wool is purchased by middlemen, and taken to Kashmir for manufacture.

In India the goat reaches perhaps the highest point of domestication. The flocks are in charge of herd-boys, but the animals are so docile that they are regarded with no hostility by the cultivators of corn and cereals. Tame goats are also kept throughout Africa. The valuable Angora breed, from which mohair is obtained, is now domesticated in South Africa and in Australia. In the former country it is a great commercial success. The animals were obtained with great difficulty, as the Turkish owners did not wish to sell their best-bred goats; but when once established at the Cape, it was found that they proved better producers of mohair than when in their native province of Angora. The clip from their descendants steadily improves.

We now pass to consider various species of wild goats, all of which present very interesting features for our study.

THE TURS

In the Caucasus, both east and west, in the Pyrenees, and on the South Spanish sierras three fine wild goats, with some features not unlike the burhal sheep, are found. They are called turs by the Caucasian mountaineers. The species found in the East Caucasus differs from that of the west of the range, and both from that of Spain. The East Caucasian tur is a massive, heavy animal, all brown in color, except on the fronts of the legs, which are blackish, and with horns springing from each side of the skull like half-circles. The males are thirty-eight inches high at the shoulder. The short beard and tail are blackish, and there is no white on the coat. The West Caucasian tur is much lighter in color than that of the East Caucasus, and the horns point backward, more like those of the ibex, though set on the skull at a different angle. The Spanish tur has the belly and inner sides of the legs white, and a blackish line along the

flank, dividing the white from the brown; also a blackish chest, and some gray on the flank.

In the Caucasus turs are found on the high crags above the snow-line in summer, whence they descend at night to feed on patches of upland grass; but the main home of the tur by day is above the snow-line. The Spanish species modifies its habits according to the ground on which it lives. Mr. E. N. Buxton found it in dense scrub, while on the Andalusian sierras it frequents bare peaks 10,000 feet high. In Spain tur are sometimes seen in flocks of from 100 to 150 each.

THE PERSIAN WILD GOAT

The original of our domesticated goat is thought by some to be the pasang, or Persian wild goat. It is a fine animal, with large simitar-shaped horns, curving backward, flattened laterally, and with knobs on the front edge at irregular intervals. It is more slender in build than the tur, light brown in general color, marked with a black line along the nape and back, black tail, white belly, blackish shoulder-stripe, and a black line dividing the hinder part of the flank from the white belly. Formerly found in the islands of Southeastern Europe, it now inhabits parts of the Caucasus, the Armenian Highlands, Mount Ararat, and the Persian mountains as far east as Baluchistan. A smaller race is found in Sind. It lives in herds, sometimes of considerable size, and frequents not only the high ground, but the mountain forests and scrub, where such cover exists. The domesticated goat of Sweden is said to be certainly a descendant of this species.

THE IBEX

Of the ibex, perhaps the best known of all the wild goats, several species, differing somewhat in size and in the form of their horns, are found in various parts of the Old World. Of these, the Arabian ibex inhabits the mountains of Southern Arabia, Palestine, and Sinai, Upper Egypt, and perhaps Morocco. The Abyssinian ibex is found in the high mountains of the

country from which it takes its name. The Alpine ibex is now extinct in the Swiss Alps and Tyrol, but survives on the Piedmontese side of Monte Rosa. The Asiatic ibex is the finest of the group; its horns have been found to measure nearly fifty-five inches along the curve. This ibex inhabits the mountain ranges of Central Asia, from the Altai to the Himalayas, and the Himalayas as far as the source of the Ganges.

The King of Italy is the great preserver of the Alpine ibex, and has succeeded where the nobles of the Tyrol have failed. The animals are shot by driving them, the drivers being expert mountaineers. The way in which the ibex come down the passes and over the precipices is simply astonishing. One writer lately saw them springing down perpendicular heights of forty feet, or descending "chimneys" in the mountain-face by simply cannoning off with their feet from side to side. Young ibexes can be tamed with ease, the only drawback to their maintenance being the impossibility of confining them. They will spring on to the roof of a house, and spend the day there by preference, though allowed the run of all the premises. The kids are generally two in number; they are born in June.

The ibex was long one of the chief objects of the Alpine hunter. The Emperor Maximilian had a preserve of them in the Tyrol mountains, and he shot them with a crossbow when they were driven down. He tells us in his private hunting-book that he once shot an ibex at a distance of two hundred yards with a crossbow, after one of his companions had missed it with a gun, or "fire-tube." When away on an expedition in Holland, he wrote a letter to the wife of one of the most noted ibex-poachers on his domain, promising her a silk dress if she could induce her husband to let the animals alone. In the Himalayas the chief foes of the ibex are the snow-leopard and wild dog.

THE MARKHOR

The very fine Himalayan goat of this name differs from all other wild species. The horns are spiral, like those of the kudu antelope and Wallachian sheep. It may well be called the king of the wild goats. A buck stands as much as forty-one

inches at the shoulder, and the maximum measurement of the horns is sixty-three inches! It has a long beard and mane, and stands very upright on its feet. Besides the Himalayas, it haunts the mountains on the Afghan frontier. These goats keep along the line between the forest and snow, some of the most difficult ground in the hills. The horns are a much-prized trophy.

THE TAHR

The tahr of the Himalayas is a very different-looking animal from the true goats, from which, among other characters, it is distinguished by the form and small size of the horns. The horns, which are black, spring in a high backward arch, but the creature has no beard. A buck stands sometimes as much as thirty-eight inches high at the shoulder. It has a long, rough coat, mainly dark stone-color in tint.

These animals live in the forest districts of the Middle Himalayas, where they are found on very high and difficult ground. General Donald Macintyre shot one standing on the brink of an almost sheer precipice. Down this it fell, and the distance in sheer depth was such that it was difficult to see the body even with glasses. The tahr is fairly common all along the higher Himalayan Range. Its bones are believed to be a sovereign cure for rheumatism, and are exported to India for that object. A smaller kind is found in the mountains of Eastern Arabia, where very few, even sportsmen, have yet attempted to shoot them.

THE NILGIRI TAHR, OR NILGIRI IBEX

Though not an ibex, the sportsmen of India early gave this name to the tahr of the Nilgiri and Anamalai hills. The Himalayan species is covered with long, shaggy hair; the South Indian, has short smooth brown hair.

"The ibex," says Hawkeye, the Indian sportsman; of this animal, "is massively formed, with short legs, remarkably strong fetlocks, and a heavy carcass, short and well ribbed up,

combining strength and agility wonderful to behold. Its habits are gregarious, and the does are seldom met with separate from the flock or herd, though males often are. The latter assume, as they grow old, a distinctive appearance. The hair on the back becomes lighter, almost white in some cases, causing a kind of saddle to appear; and from that time they become known to the hunters as the saddlebacks of the herd, an object of ambition to the eyes of the true sportsman. It is a pleasant sight to watch a herd of ibex feeding undisturbed, the kids frisking here and there on pinnacles or ledges of rock and beetling cliffs where there seems scarcely safe hold for anything much larger than a grasshopper, the old mother looking calmly on. Then again, see the caution observed in taking up their resting or abiding places for the day, where they may be warmed by the sun, listening to the war of many waters, chewing the cud of contentment, and giving themselves up to the full enjoyment of their nomadic life and its romantic haunts. Usually, before reposing, one of their number, generally an old doe, may be observed gazing intently below, apparently scanning every spot in the range of her vision, sometimes for half an hour or more, before she is satisfied that all is well, but, strange to say, seldom or never looking up to the rocks above. Then, being satisfied on the one side, she follows the same process on the other, and eventually lies down calmly, contented with the precautions she has taken. Should the sentinel be joined by another, or her kid come and lie by her, they always lie back to back, in such a manner as to keep a good lookout to either side. A solitary male goes through all this by himself, and wonderfully careful he is; but when with the herd he reposes in security, leaving it to the female to take precautions for their joint safety." Is it not pleasanter to think of watching such innocent creatures, looking out for their own safety, than to think of hunting and killing them?

THE ROCKY MOUNTAIN GOAT

America possesses only one species of wild goat, the place of this genus being taken in the southern part of the continent

by the camel-like guanacos. The Rocky Mountain goat, the North American representative of the group, has very few of the characteristics of the European and Asiatic species. In place of being active in body and lively in temperament, it is a quiet, rather drowsy creature, able, it is true, to scale the high mountains of the Northwest and to live among the snows, but with none of the energetic habits of the ibex or the tahr. In form it is heavy and badly built. It is heavy in front and weak behind, like a bison. The eye is small, the head large, and the shoulders humped. It feeds usually on very high ground; but hunters who take the trouble to ascend to these altitudes find little difficulty in killing as many wild goats as they wish. These goats are most numerous in the ranges of British Columbia, where they are found in small flocks of from three or four to twenty. Several may be killed before the herd is thoroughly alarmed, possibly because at the high altitudes at which they are found man has seldom disturbed them. None of the domesticated sheep or goats of the New World are native to the continent of America. It is a curious fact, well worth studying from the point of view of the history of man, that, with the exception of the llama, the dog, and perhaps the guinea-pig, every domesticated animal in use from Cape Horn to the Arctic Ocean has been imported. The last of these importations is the reindeer, which, though the native species abounds in the Canadian woods, was obtained from Lapland and Eastern Asia.

When the first rush to Klondike was made, the miners were imprisoned and inaccessible during the late winter. The coming of spring was the earliest period at which communication could be expected to be restored, and even then the problem of feeding the transport animals was a difficult one. The United States government decided to try to open up a road from Alaska by means of sledges drawn by reindeer, and the Canadian government devised a similar scheme. Agents were sent to Lapland and to the tribes on the western side of Bering Sea, and deer, drivers, and harness obtained from both. The deer were not used for the Klondike relief expeditions by the Americans; but the animals and their drivers were kept in Alaska, native

reindeer were caught, and were found very useful for carrying the mails in winter.

THE CHAMOIS

The goats are linked with the antelopes by the famous chamois, which is especially interesting because it makes its home among the snow-clad mountains of Europe. It is a pretty little creature about two feet in height, with a pair of short black horns which spring upright from the forehead, and are then sharply hooked, with the points directed backward. And its coat, strange to say, instead of becoming paler in winter grows darker, so that from brownish yellow it deepens into rich chestnut.

The chamois is one of the most active of all living animals, leaping from rock to rock, and skipping up and down steep cliffs, where it would seem quite impossible for it to obtain any foothold at all. It will often spring down, too, from a very great height, never seeming to injure itself and always alighting upon its feet. And as it is very sharp-sighted and exceedingly wary, a hunter finds the utmost difficulty in approaching, and very often for days together he never has the chance of obtaining a shot.

When a chamois notices any sign of danger, it utters a shrill whistling cry, on hearing which all the members of the herd instantly take to flight. There are generally from fifteen to twenty animals in each herd, consisting partly of does and partly of young bucks. The old bucks spend most of the year quite by themselves. But early in the autumn they rejoin the herds, drive away their younger rivals, and then fight fierce battles with one another for the mastery.

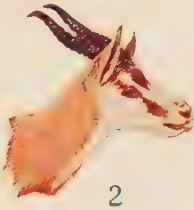
The young of the chamois are born in May or June, and are so strong and active that when they are only a day old they can follow their mother almost anywhere.

THE ELAND

This is the finest of the antelopes, and is a really magnificent animal, for it stands from five to six feet high at the shoulder,



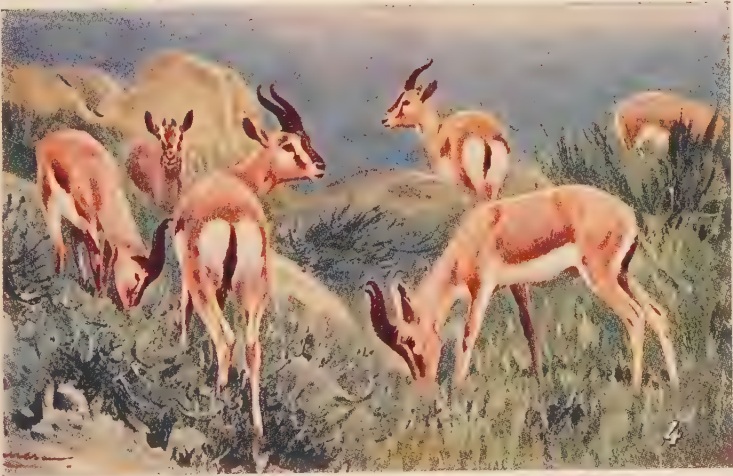
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TYPES OF ANTELOPES

1. Waterbuck.
2. Dorcas Gazelle.
3. Indian Blackbuck.
4. Springboks.
5. Oryx.
6. Eland.
7. Sable Antelope.

and sometimes an eland weighs nearly fifteen hundred pounds! Both the buck and the doe have spirally twisted horns, which are generally about two feet long, and there is a heavy dewlap under the throat. In color the animal is pale fawn, but sometimes the old males are bluish gray.

In former days the eland was spread all over Southern and Eastern Africa. But it has been so much hunted on account of its hide that it has quite disappeared from South Africa, and is fast disappearing elsewhere. There seems reason to fear that soon this splendid antelope will be altogether extinct. It lives for the most part in wooded plains, and is generally found in large herds, which spend the daytime hiding in the forests, and come out into the open country by night to graze and drink. In the desert districts, however, where water is scarce, they quench their thirst by feeding upon melons.

The eland is a difficult animal to hunt, for besides being very wary and very timid, it is often accompanied by a rhinoceros-bird, which gives it early warning of the approach of a foe. And, further, it is very swift of foot, so that it can only be ridden down by a good horse. As a rule it will never fight. But when a doe has calves with her, she will withstand the onset of dogs, and has even been known to impale them upon her horns.

THE KUDU

This is another very fine antelope. It can easily be distinguished from the eland by the shape of the horns of the male, which are twisted like a corkscrew, while the female has none at all. Besides this, it has a white mark across its face, shaped something like the letter V, several white spots on its cheeks and throat, a white streak along its back, and several others running down its sides and hinder quarters. It stands rather more than four feet in height at the shoulder, and the horns are often more than three feet long.

The kudu is found all over Africa, from the Cape to Abyssinia, though it is now very rare in the extreme south. It does not live in herds, as a rule, but is generally found in pairs, which pass the day in dense thickets, and come out to graze in the

evening. It is not very swift of foot, and can easily be run down by a man on horseback. But as it is chiefly found in the country infested by the terrible tsetse-fly, whose bite kills horses in a few days, it is generally hunted only with dogs.

THE GEMSBOK

Another very fine antelope is the gemsbok, which is found in the more desert regions of Southwestern Africa. It is remarkable for its very long straight horns, which sometimes measure nearly four feet from base to tip, and are such formidable weapons that the animal has been known to drive off even the lion. More than once, indeed, a lion and a gemsbok have been found lying dead together, the antelope having thrust his horns deep into the lion's body, and been quite unable to withdraw them.

What the gemsbok feeds upon is rather a mystery, for it is often found in districts where there is no vegetation except a little dry scrub. Yet it nearly always seems to be in good condition. And it is odder still to find that for months together sometimes it must go without drinking! Some hunters, indeed, have declared that they are quite positive that the animal never drinks at all, obtaining all the moisture it needs from small watermelons and certain bulbous roots.

The gemsbok is of about the same size as the kudu, and is gray in color above and white below. But there is a black streak across the face, while another streak, which is much broader, runs along the sides, dividing the gray of the upper parts from the white of the lower. This antelope is hunted on horseback, and is so swift and so enduring, that there is said to be no animal in Africa which is harder to overtake.

THE SPRINGBOK

The most graceful and elegant of all the antelopes are the gazelles, of which we may take the springbok as an example.

In former days this was by far the most abundant of all the African game animals, and would sometimes be seen traveling

from one district to another in enormous herds, covering the country as far as the eye could reach. So vast were these herds, indeed, and so closely did the animals march side by side together that sometimes a lion would be seen in their ranks marching along with them, quite unable to stop, or to make his escape, because of the pressure all round him!

The springbok, or "springbuck," owes its name to its marvelous activity, and to its curious habit of suddenly leaping straight up into the air. In this way it can easily spring to a height of eight or ten feet.

The springbok is easily tamed, and soon comes to know who are its friends. One of these animals was kept as a pet by a lady living at Klerksdorp, in South Africa, and would wander about the town by itself, not seeming to be in the least afraid of the passers-by, or even of the dogs. Every morning, too, it would cross the river, and go out upon the veldt to feed; and although it would mix freely with its wild companions during the day, it always left them in the evening and came home to sleep.

In height the springbok stands about two feet six inches, and it can easily be distinguished from all the other gazelles by the white streak which runs along the middle of the back. The horns are black, with a number of ridge-like rings running round them, and the color of the coat is dark cinnamon-yellow above and white beneath, with a blackish stripe on the flanks between the two.

GNUS

If the gazelles are the most graceful of all the antelopes, the gnus, also known as wildebeests, are certainly the most ungainly, their great broad heads, and very high shoulders giving them an extremely awkward appearance. Then the curved horns are very broad at the base, and are set so closely together on the forehead that they form a sort of helmet, like those of the Cape buffalo, while the muzzle is fringed with long bristles, and there is an upright mane of stiff hairs upon the neck. So that altogether the gnu cannot be considered as a handsome animal!

Two kinds of gnus are known, both of which are found in Southern and Eastern Africa. The commoner of the two is called the white-tailed gnu, because it has a long white tail, while the other, the brindled gnu, has a black one. Both animals stand about four feet six inches in height at the shoulder.

Gnus are very suspicious, very inquisitive, and very timid, and when they catch sight of a human being, they often behave in a most extraordinary way, prancing about, pawing the ground, capering on their hind legs, leaping into the air, and whisking their long tails about in the most absurd manner. Then some will chase the others round and round in circles. Next they will come charging on in a long line like cavalry, as though they meant to attack. And then, quite suddenly, the whole herd will wheel round, and dash off together, enveloped in a cloud of dust!

They are so inquisitive that a hunter has often attracted a gnu to within a very few yards just by tying a red handkerchief to the muzzle of his gun, and allowing it to flutter in the breeze like a flag!

Other antelopes that we should like to tell about have been described by travelers and hunters. The sable antelope of South Africa, for example, is regarded by Mr. Ernest Ingersoll as perhaps "the most admirable of all antelopes," the object of "an admiring enthusiasm among sportsmen" as well as naturalists. But as we cannot find space to describe all these interesting creatures, we must leave you to learn about some of them in books wholly designed to make them known.

CHAPTER XVI

GIRAFFES, DEER, CAMELS, ZEBRAS, ASSES, AND HORSES

Here we reach a number of animals with which you have more or less acquaintance, and about which you cannot fail to be interested in hearing any particulars that we may be able to set down for you.

GIRAFFES

THESE are the tallest of all living animals, for a full-grown male may stand eighteen or even nineteen feet in height. Just think of it! If one elephant were to stand upon another elephant's back a giraffe could look over them both.

This wonderful height is chiefly due to the great length of the neck. Yet there are only seven *vertebræ*, or joints of the spine, in that part of the body, just as there are in our own necks. But then each of these joints may be as much as a foot long! When the animal is hungry, its height is of very great use to it, enabling it to feed upon the leaves of trees which do not throw out branches near the ground. And in captivity, of course, its manger has to be put quite close to the roof of its stable.

Strange to say, the giraffe plucks each leaf separately by means of its tongue, which is very long indeed and very slender, and is prehensile at the tip, like the tail of a spider-monkey. So it can be coiled round the stem of a leaf in order to pull it from the branch. And sometimes at the zoo you may see a giraffe snatch flowers out of ladies' hats and bonnets by means of this curious tongue.

If a giraffe wants to feed upon grass instead of leaves, it straddles its front legs very widely apart, and then bends its

long neck down between them. And it does just the same when it drinks.

The giraffe is a fast runner, and a horse must be very swift to overtake it. It runs in a most singular manner, with "a queer camel-like gallop," and throwing out the hind legs with a semicircular movement, while its long neck goes rocking backward and forward like that of a toy donkey, and the long tail switches up and down as regularly as if it were moved by clockwork. So a long line of giraffes all running away together must look very odd indeed.

You would think that giraffes would be very easily seen, even in the forest, wouldn't you? Yet every hunter tells us that as long as they are standing still it is almost impossible to detect them, since they look just like the stems and foliage of the trees, with the sunlight shining in patches between the leaves!

Giraffes are found in various parts of Africa, south of the Sahara, and two different varieties are known, that from South Africa being much the darker of the two, and having the spots much larger and closer together. A third kind, with five of the so-called horns on the head, has been recorded by Sir Harry Johnston.

THE OKAPI

A still more remarkable discovery, made in the same forest district by the same famous explorer, was that of the okapi, which is a very singular animal. Perhaps we can best describe it to you by saying that it is something like a giraffe, and something like an antelope, and something like a zebra, and something like an ox! The color of its coat is like that of a very red cow, there are zebra-like stripes on the fore and hind quarters, and the legs are cream-colored, while on the skull are faint traces of horns like those of the giraffe.

We do not as yet know much about the habits of this wonderful animal, except that it lives in the thickest parts of the forest, seems to go about in pairs, and to feed wholly on leaves and twigs.

THE DEER

In some ways these animals are not unlike antelopes. But one great difference between the two is this. In the antelopes the horns are hollow, growing upon bony cores which spring from the skull, and remain all through the life of the animal. But in the deer they are solid, and are thrown off every year, fresh ones growing in their places in the course of four or five months. Then the material of which they are made is altogether different, for whereas the horns of the antelopes really consist of highly compressed hair, those of the deer are composed of lime, and are very much more like bone. On account of these differences horns of deer are better called antlers.

The way in which these antlers grow is very curious. For some little time after they are shed the animal is extremely timid, for he knows perfectly well that he has lost his natural weapons. So he hides away in the thickest parts of the forest, where none of his enemies are likely to find him. After a while, two little knobs make their appearance on the head, just where the horns used to be. These knobs are covered with a close furry skin, which is known as the velvet, and if you were to take hold of them you would find that they were quite hot to the touch. That is because the blood is coursing rapidly through them, and leaving particles of lime behind it as it goes. Day by day they increase in size, throwing out branches as they do so, until they are rather larger than the pair which were cast off. Then the blood-vessels close up, and the velvet becomes dry and begins to fall off, sometimes hanging down in long strips, which are at last rubbed off against the trees and bushes.

REINDEER AND CARIBOU

A great many kinds of deer are found in different parts of the world, perhaps the most famous of all being the reindeer.

This is the only deer in which the does possess horns as well as the stags. It is found in the northern parts of Europe and Asia and also of North America, where it is called the

caribou and generally lives in large herds. During the winter and spring these herds remain in the forests. But in summer they are so annoyed by flies that they make their way to the hills, ascending to such a height that their insect enemies cannot follow them, and there they remain until the autumn. A number of herds usually join together when they are migrating in this way, and the appearance of thousands upon thousands of the animals traveling slowly along, each with its antlers uplifted, has been compared to that of a moving forest of leafless trees.

In Siberia, Lapland, and Norway, large herds of reindeer are kept as we keep cattle, and are used as beasts both of draught and burden. A single reindeer can carry a weight of about 130 pounds upon its back, or draw a load of 190 pounds upon a sledge, and it so enduring that it will travel at the rate of from eight to ten miles an hour for twelve hours together.

"The caribou," says Mr. Ingersoll, "has never been utilized by any of the people of arctic America, although just across Bering Strait the same animal was kept in large herds by the Chuckchis of Siberia. The United States government has attempted to repair this deficiency by introducing large numbers of Lapp reindeer among the Alaskans, and the experiment is proving successful." (See also page 173.)

During the summer reindeer can obtain plenty of food, but in the winter they have to live upon a kind of white lichen, which grows in waste, dry places. Very often, of course, this is covered with snow, which the animals have to scrape away with their hoofs. But when a slight thaw is followed by a frost they find it very difficult to do this, and sometimes they actually perish from starvation.

The color of the reindeer varies slightly at different seasons of the year, the coat usually being sooty brown in summer and brownish gray in winter. The nose, neck, hind quarters, and lower parts of the body are always white or whitish gray.

The people of Lapland, Finland, and Siberia have for a long time domesticated reindeer, finding their flesh good to eat, and their hides, horns, and sinews valuable for making clothing and implements of various kinds. Their milk makes excellent cheese, which in those regions is an important article of food,

THE ELK, OR MOOSE

The elk, which is found in the same parts of the world as the reindeer, is a much larger animal. Indeed, it is the biggest of all living deer, a full-grown stag standing well over six feet in height at the withers, and sometimes weighing as much as twelve hundred pounds. It is not at all a graceful creature, for the neck is very short, and the head is held below the level of the shoulders, while the antlers are so enormously large that it hardly seems possible that the animal should be able to carry them.

One would think that when the elk was traveling through the forest these huge antlers would be constantly getting entangled among the branches of the trees. But the animal is able to throw them well back upon its shoulders, so that they do not really interfere with its progress in the least.

In America this animal is known as the moose, and is generally found in small parties, consisting of a buck, a doe, and their fawns of two seasons. During the summer they live near swamps or rivers, where there is plenty of rich, long grass. But as soon as winter comes on they retire to higher ground and spend the next few months in a small clearing in the midst of the thickest forest. These clearings are generally called moose-yards, and you might think, perhaps, that when a hunter had discovered one he would have no difficulty in shooting the animals. But they are so wary that it is almost impossible to approach them, either by day or by night, and many a hunter has followed them for weeks without obtaining a shot.

The Indians attract the moose within range by imitating the cry of the doe, which they do so cleverly that if a buck is within hearing he is sure to come up to the spot. Or they will rattle a moose's shoulder-bone against the bark of a tree so as to make a sound like the call of the buck, which any buck in the neighborhood is sure to take as a challenge to fight. For these animals are very quarrelsome creatures, and wage fierce battles with one another, sometimes using their antlers with such effect that both combatants die from their wounds.

The deer family is so large that we must content ourselves with briefly mentioning a few of its members. First we will speak of three of the Old World deer, and of these as they are seen in Great Britain, whose literature has so much to say of them.

THE RED DEER

This is the noblest object of the chase in Europe. The only part of England in which it is now really wild is Exmoor, where it is still quite plentiful. But in many parts of the Scottish Highlands it is carefully preserved, large moorland districts being given up to it under the title of deer forests.

When the female deer has a little fawn to take care of, she generally hides it among very tall heather, pressing it gently with her nose to make it lie down. There it will remain all day long without moving, till she returns to it in the evening. But she is never very far away, and is always ready to come at once to its aid if it should be attacked by a fox or a wildcat.

The stag of this animal is a good deal larger than the doe, and may stand as much as four feet high at the shoulder, while its antlers may be more than three feet long. In color it is a bright reddish brown, which often becomes a good deal paler during the winter.

THE FALLOW DEER

This deer is not nearly so big as the red deer. It is never more than three feet in height, while you can also distinguish it by the fact that the antlers are flattened out at the tip into a broad plate, and that the coat is spotted with white.

This is the deer which is kept in so many English parks, where one may often see a herd of a hundred or more of the pretty, graceful animals moving about together.

There is always a "master" deer in each of these herds, who has won his post by fighting and overcoming all his rivals. He does not always remain with the herd, but often lives apart for weeks together, accompanied, perhaps, by three or four favorite



THE ANTLERED DEER

1. Virginian, or White-tailed Deer. 2. East Indian Sambar. 3. Moose; European Elk. 4. East Indian Jungle Deer. 5. Roe Deer. 6. Wapiti; American Elk. 7. Caribou; Reindeer. (All are stags.)

does; and in his absence the herd is led by some of the younger bucks. But whenever he makes his appearance these make way for him, and no one disputes his sway until he becomes too old and infirm to hold his position any longer.

The male fallow deer is known by different names at different times of his life. In the first year he is called a "fawn," in the second year a "pricket," in the third a "sorrel," and in the fourth a "soare," while when he is five years old he is described as a "buck of the first lead," and when he is six as a "buck complete."

THE ROEBUCK

This is quite a small animal, seldom exceeding twenty-six inches in height at the shoulder. In color it is reddish or grayish brown above and grayish white underneath, with a white patch on the chin and another round the root of the tail. The antlers stand nearly upright, and throw off one "tine," or spur, in front, and two more behind.

There is only one part of England where the roebuck is found wild, and that is Blackmoor Vale, in Dorsetshire. But it is common in many of the Scottish moors and forests. It is never seen in herds, like the fallow deer, but goes about in pairs, although when there are fawns they accompany their parents.

The roebuck sheds its antlers in December, and the new ones are fully developed by about the end of February. Although they are seldom more than eight or nine inches long they are really formidable weapons, more especially as the deer is very powerful in proportion to its size. The bucks are very quarrelsome creatures and fight most savagely with one another, while more than once they have been known to attack human beings and to inflict severe wounds before they could be driven away.

AMERICAN DEER

Excepting the moose, caribou, and wapiti, often wrongly called an elk, found in the western United States and some parts of Canada, the deer of North and South America stand quite

apart from those of the Old World, and are placed in a genus of their own. Usually the tail is long, and the brow-antler is always wanting. The most familiar species is the common American deer, of which the Virginia or white-tailed deer is the type. This deer is found in varying forms in both continents, and was regularly hunted by the ancient Mexicans with trained pumas.

The well-known Virginia deer found in Eastern North America, and believed to range as far south as Louisiana, stands a trifle over three feet in height, and weighs, clean, about one hundred and seventy-five pounds. The coloration is chestnut in summer, bluish gray in winter. The antlers are of good size, and usually measure from twenty to twenty-four inches in length. As a sporting animal the white-tailed deer is not popular. It has been described as "an exasperating little beast," possessing every quality which a deer ought not to, from the sportsman's point of view. "His haunts are river-bottoms, in choking, blinding bush, and his habits are beastly. No one could ever expect to stalk a white-tail; if you want to get one, you must crawl." Mr. Selous bagged one of these deer somewhat curiously. "He was coming," he writes, "through the scrubby, rather open bush straight toward me in a series of great leaps, rising, I think, quite four feet from the ground at every bound. I stood absolutely still, thinking to fire at him just as he jumped the stream and passed me. However, he came so straight to me that, had he held his course, he must have jumped on to or over me. But when little more than the width of the stream separated us—when he was certainly not more than ten yards from me—he either saw or winded me, and, without a moment's halt, made a prodigious leap sideways. I fired at him when he was in the air, and I believe quite six feet above the ground." The deer, an old buck with a good head, was afterward picked up dead. In different parts of America, as far south as Peru and Bolivia, various local races of this deer are to be found.

THE MULE-DEER

The mule-deer is found in most parts of North America west of the Missouri, as far south as Southern California, stands

about three feet four inches at the shoulder, and weighs over two hundred and forty pounds. It carries good antlers, measuring as much as thirty inches, and in color is tawny red in summer, brownish gray in winter. It is a far better sporting animal than the sneaking white-tailed deer, and affords excellent stalking. This deer is still abundant in many localities. It is commonly called "blacktail," but the true blacktail is a similar but smaller species confined to the Northern Pacific coast.

THE WAPITI

This is the largest and finest of American deer, originally numerous everywhere west of the Appalachian Mountains, but now to be found only in the mountains of the Northwest. It is much like the European red deer, but very much larger, and is connected with it by a series of stags, known as the maral, shou, etc., inhabiting Central Asia from Persia to Kamchatka. It grazes like cattle, rather than browses; and in the fall gathers into herds, which formerly contained many thousands and spent the winter among sheltering hills.

MARSH-DEER

In South America are to be found several kinds of marsh-deer, of which the best known has its range from Brazil to the forest country of the Argentine Republic. The marsh-deer is almost equal in size to the red deer of Europe, but somewhat less stout of build; the coloring is bright chestnut in summer, brown in winter; the coat is long and coarse, as befits a swamp-loving creature; the antlers usually display ten points, and measure more than twenty inches.

THE PAMPAS-DEER

This species, closely allied to the marsh-deer, is of small size, standing about two feet six inches at the shoulder. The antlers, usually three-pointed, measure no more than from twelve to fourteen inches in fine specimens. The pampas-deer is found from Brazil to Northern Patagonia.

PERUVIAN AND CHILEAN GUEMALS

These are small deer, found on the high Andes, and are somewhat inferior in size to the Virginia deer. The males carry simple antlers forming a single fork, and measuring about nine inches. The coat, yellowish brown in hue, is coarse, thick, and brittle. The Chilean guemal is found also in most parts of Patagonia; unlike the guemal of Peru, which delights in altitudes of from 14,000 to 16,000 feet, it lives chiefly in deep valleys, thick forest, and even the adjacent plains, to which it resorts in winter.

BROCKETS

Of these, several species are found in South and Central America and Trinidad. They are small deer, having spike-like antlers and tufted crowns. The largest is the red brocket, found in Guiana, Brazil, and Paraguay, which stands twenty-seven inches at the shoulder. The body coloring is brownish red. Like most of the group, this brocket is extremely shy; but although fond of dense covert, it is found also in open patches. The pygmy brocket, a tiny dark-brown deerlet, less than nine-teen inches in height, found in Central Brazil, is the smallest of these very small deer.

PUDUS

Two other diminutive deer, known as pudus, closely allied to the brockets, are found in South America. These are the Chilean and Ecuador pudus, of which the former is only about thirteen inches in height, the latter about fourteen or fifteen inches. Little is known of the history and life habits of these charming little creatures, one of which, the Chilean species, has occasionally been seen in zoölogical gardens.

CAMELS

We now come to a remarkably interesting animal. First let us tell you how wonderfully the camel is suited to a life in the desert.

In the first place, it has great spreading feet. Now this is very important, for if the animal had small, hard hoofs, like those of the horse or the donkey, it would sink deeply into the loose sand at every step, and would soon be so tired out that it would be quite unable to travel any farther. But its broad, splay, cushion-like toes do not sink into the sand at all, and it can march easily along, hour after hour, where a horse could scarcely travel a mile.

Then it can go for several weeks with hardly any food. All that it finds as it journeys through the desert is a mouthful or two of dry thorns, and even at the end of the day its master has nothing to give it but a few dates. And on this meager diet it has to travel forty or fifty miles a day with a heavy load on its back.

But then, you must remember, the camel has a hump. Now this hump consists almost entirely of fat, and as the animal marches on day after day with scarcely any food, this fat passes back by degrees into its system, and actually serves as nourishment. So, you see, while the camel is traveling through the desert it really lives chiefly on its own hump! By the time that it reaches its journey's end, the hump has almost entirely disappeared. Little more is left in its place than a loose bag of empty skin. The animal is then unfit for work and has to be allowed to graze for two or three weeks in a rich pasture. Then, day by day, the hump fills out again, and when it is firm and solid once more the camel is fit for another journey.

More wonderful still, perhaps, is its way of carrying enough water about with it to last for several days.

Except the camel, typical ruminating animals, or those which chew the cud, have the stomach divided into four separate compartments, through which the food passes in turn. These are called the paunch, the honeycomb stomach or bag, the manyplies and the abomasum. In the camel the third of these is wanting, and the first and second are provided with a number of deep cells, which can be opened or closed at the will of the animal.

In these cells the animal is able to store up water. When

it has the opportunity of drinking, it not only quenches its thirst, but fills up all these cells as well. In this way it can store up quite a gallon and a half of liquid. Then, when it grows thirsty, and cannot find a pool or a stream, all that it has to do is to open one or two of the cells and allow the contents to flow out, and so on from time to time until the whole supply is exhausted.

In this way a camel can easily go for five or six days without requiring to drink, even when marching under the burning sun of the desert.

Two kinds of camels are known, neither of which is now found in a wild state.

ARABIAN CAMEL

The first of these is the Arabian camel, which only has one hump on its back, and is so well known that there is no need to describe it. It is very largely used in many parts of Africa and Asia as a beast of both draught and burden. Camels for riding upon, however, are generally called dromedaries, and may be regarded as a separate breed, just as hunters are a separate breed from cart-horses. And while they will travel with a rider upon their backs at a pace of eight or nine miles an hour, an ordinary camel with a load upon its back will scarcely cover a third of that distance in the same time.

This camel is a bad-tempered animal. It gets very cross when it is made to kneel down to be loaded, and crosser still when it has to kneel again in the evening for its burden to be removed, and all day it goes grunting and snarling and groaning along, ready to bite any one who may come near it. And it is so stupid that if it wanders off the path for a yard or two, in order to nibble at a tempting patch of herbage, it goes straight on in the new direction, without ever thinking of turning back in order to regain the road.

Besides being used for riding and for carrying loads, the camel is valuable on account of its flesh and also of its milk, while its hair is woven into a kind of coarse cloth.



CHILDREN'S PETS AT THE ZOO.

1. Guanaco and Young.

2. Dorcas Gazelle.

3. Bactrian Riding Camel.

BACTRIAN CAMEL

This camel, which comes from Central Asia, has two humps on its back instead of one. It is not quite so tall as the Arabian animal, and is more stoutly and strongly built, while its hair is much longer and more shaggy. For these reasons it is very useful in rocky and hilly country, for it can scramble about for hours on steep and stony ground without getting tired, while its thick coat protects it from the cold.

LLAMAS

Llamas may be described as South American camels. But they are much smaller than the true camels, and have no humps on their backs, and their feet are not nearly so broad and cushion-like, while their thick woolly coat grows in dense masses, which sometimes reach almost to the ground.

There are four kinds of llamas, but we can only tell you about one of them, the guanaco.

This animal lives both among the mountains and in the plains. It is generally found in flocks, consisting of a single male and from twelve to fifteen females. But sometimes the flocks are much larger, and more than once several hundred animals have been seen together. The male always keeps behind the flock, and if he notices any sign of danger he utters a curious whistling cry. The does know exactly what this means and at once take to flight, while the male follows, stopping every now and then to look back and see if they are being pursued.

Usually, when two male guanacos meet, they fight, biting one another most savagely, and squealing loudly with rage. When one of these animals is killed, its skin is likely to be found deeply scored by the wounds it has received from its numerous antagonists.

If you go to look at the llamas in a zoo, we would advise you not to stand too near the bars of their enclosure, for they have a habit of spitting straight into one's face! When they are used

for riding they will often turn their heads round and spit at their rider, just to show that they are getting tired. And if once they lie down no amount of persuasion or even of beating will make them get up again, until they consider that they have had a proper rest!

ZEBRAS

There are three different kinds of these beautiful animals. The largest and finest is known as Grévy's zebra, which is found in the mountains of Somaliland. It has many more stripes than the other two, while the ground color is quite white. The smallest is the mountain zebra, which is only about as big as a good-sized pony, and has its legs striped right down to the hoofs. This is now a very scarce animal, being only found in one or two mountainous districts in South Africa, where no one is allowed to interfere with it. And between the two is the Burchell's zebra, which is about as large as a small horse, and has its legs white, with only a very few markings. This animal is quite common in many parts of the South African plains, and has often been domesticated, and taught to draw carriages and carts. Indeed, in some districts of Southern Africa, a coach drawn by a team of zebras instead of horses is not a very uncommon sight.

You would think that an animal, colored like the zebra would be very easily seen, even by night, wouldn't you? But strange to say, these creatures are almost invisible from a distance of even a few yards. Indeed, hunters say that they have often been so close to a zebra at night that they could hear him breathing, yet have been quite unable to see him!

This seems to be due to his stripes, for it has been found that while a pony can be easily seen from forty or fifty yards away on a moonlight night, it at once becomes invisible if it is clothed with ribbons in such a way as to resemble the stripes of the zebra!

Zebras are generally found in herds, and they have a curious habit of traveling about in company with a number of brindled gnus and ostriches, which all seem to be as friendly as possible together.

THE QUAGGA

The quagga, which became extinct some time ago, never had a very extended range, but once it existed in great numbers on all the upland plains of Cape Colony to the west of the Kei River, and in the open treeless country lying between the Orange and Vaal rivers. North of the Vaal it appears to have been unknown.

The quagga seems to have been nearly allied to Burchell's zebra—especially to the most southerly form of that species—but was much darker in general color. Instead of being striped over the whole body, it was only strongly banded on the head and neck, the dark brown stripes becoming fainter on the shoulders and dying away in spots and blotches. On the other hand, in size and build, in the appearance of its mane, ears, and tail, and in general habits, it seems to have nearly resembled its handsomer relative. The barking neigh “quā-hā-hā, quā-hā-hā” seems, too, to have been the same in both species. The Dutch word quagga is pronounced in South Africa “quā-hā,” and is of Hottentot origin, an imitation of the animal's neighing call. To-day Burchell's zebras are invariably called quā-hās by both Boers and British colonists.

WILD ASSES

The true asses are without stripes on the head, neck, and body, with the exception of a dark streak down the back from the mane to the tail, which is present in all members of the group, and in some cases a dark band across the shoulders and irregular markings on the legs.

In Africa the wild ass is only found in the desert regions of the northeastern portion of that continent. It is a fine animal, standing between thirteen and fourteen hands at the shoulder. It lives in small herds or families of four or five individuals, and is not found in mountainous districts, but frequents low stony hills and arid desert wastes. It is as a general rule an alert animal and difficult to approach, and so fleet and enduring that excepting in the case of foals and mares heavy in young, it cannot be overtaken even by a well-mounted horseman.

Notwithstanding the scanty nature of the herbage in the districts they frequent, these desert-bred asses are always in good condition. They travel long distances to water at night, but appear to require to drink regularly. Their flesh is eaten by the natives of the Soudan. The bray of the African wild ass, it is said, cannot easily be distinguished from that of the domesticated animal, which is undoubtedly descended from this breed.

In Asia three varieties of the wild ass are found, which were formerly believed to represent three distinct species; but all the local races of the Asiatic wild ass are now considered to belong to one species, and it is to them that reference is made in the description on pages 196 and 197.

These wild asses have a wide range, and are met with from Syria to Persia and Western India, and northward throughout the more arid portions of Central Asia. Like their African relatives, the wild asses of Asia are inhabitants of waste places, frequenting desert plains and wind-swept steppes. They are said to be as fleet and enduring as the others.

The wild asses of the desert plains of India and Persia are said to be very wary and difficult to approach, but the kiang of Tibet is always spoken of as a much more confiding animal, its curiosity being so great that it will frequently approach to within a short distance of any unfamiliar object, such as a sportsman, engaged in stalking other game.

Asiatic wild asses usually live in small families of four or five, but sometimes congregate in herds. Their food consists of various grasses in the low-lying portions of their range, but of woody plants on the high plateaus, where little else is to be obtained. Of wild asses in general the late Sir Samuel Baker once said: "Those who have seen donkeys only in their civilized state can have no conception of the wild or original animal; it is the perfection of activity and courage."

THE HORSE

Like the wild camels, genuine wild horses are very generally believed to be extinct. The vast herds which occur to-day in a

wild state in Europe, America, and Australia are to be regarded, say those who believe in the extinction theory, as descended from domesticated animals which have run wild. So far as the American and Australian horses are concerned, this is no doubt true; but of the European stocks it is by no means so certain. However, without giving you any theory of our own, we will quote at some length from an interesting and instructive chapter on the horse by A. B. Buckley.

"There rose before my mind the level grass-covered pampas of South America, where wild horses share the boundless plains with troops of the rhea, or American ostrich, and wander, each horse with as many mares as he can collect, in companies of hundreds or even thousands in a troop. These horses are now truly wild, and live freely from youth to age, unless they are unfortunate enough to be caught in the more inhabited regions by the lasso of the hunter. In the broad pampas, the home of herds of wild cattle, they dread nothing. There, as they roam with one bold stallion as their leader, even beasts of prey hesitate to approach them, for, when they form into a dense mass with the mothers and young in their center, their heels deal blows which even the fierce jaguar does not care to encounter, and they trample their enemy to death in a very short time. Yet these are not the original wild horses; they are the descendants of tame animals, brought from Europe by the Spaniards to Buenos Aires in 1535, whose descendants have regained their freedom on the boundless pampas and prairies.

"As I was picturing them careering over the plains, another scene presented itself and took their place. Now I no longer saw around me tall pampas-grass with the long necks of the rheas appearing above it, for I was on the edge of a dreary, scantily covered plain between the Aral Sea and the Balkash Lake in Tartary. To the south lies a barren sandy desert, to the north the fertile plains of the Kirghiz steppes, where the Tartar feeds his flocks, and herds of antelopes gallop over the fresh green pasture; and between these is a kind of no-man's land, where low scanty shrubs and stunted grass seem to promise but a poor feeding-ground.

"Yet here the small long-legged but powerful tarpans, the wild

horses of the treeless plains of Russia and Tartary, were picking their morning meal. Sturdy wicked little fellows they are, with their shaggy light-brown coats, short wiry manes, erect ears, and fiery watchful eyes. They might well be supposed to be true wild horses, whose ancestors had never been tamed by man; and yet it is more probable that even they escaped in early times from the Tartars, and have held their own ever since, over the grassy steppes of Russia and on the confines of the plains of Tartary. Sometimes they live almost alone, especially on the barren wastes where they have been seen in winter, scraping the snow off the herbage. At other times, as in the south of Russia, where they wander between the Dnieper and the Don, they gather in vast herds and live a free life, not fearing even the wolves, which they beat to the ground with their hoofs. From one green oasis to another they travel over miles of ground.

'A thousand horse—and none to ride!
With flowing tail and flying mane,
Wide nostrils—never stretched by pain,
Mouths bloodless to the bit or rein,
And feet that iron never shod,
And flanks unscarred by spur or rod,
A thousand horse, the wild, the free,
Like waves that follow o'er the sea.*

"As I followed them in their course I fancied I saw troops of yet another animal of the horse tribe, the kulan, or *Equus hemionus*, which is a kind of half horse, half ass, living on the Kirghiz steppes of Tartary and spreading far beyond the range of the tarpan into Tibet. Here at last we have a truly wild animal, never probably brought into subjection by man. The number of names he possesses shows how widely he has spread. The Tartars call him kulan, the Tibetans kiang, while the Mongolians give him the unpronounceable name of dschiggetai. He will not submit to any of them, but if caught and confined soon breaks away again to his old life, a 'free and fetterless creature.'

"No one has ever yet settled the question whether he is a horse

*Byron's "Mazeppa."



WILD RELATIVES OF THE HORSE.

1. Northern or Grévy's Zebra.
2. Abyssinian Ass.
3. Southern (or Burchell's) Zebra.
4. Przewalsky's Central-Asian Horse.

or an ass, probably because he represents an animal truly between the two. His head is graceful, his body light, his legs slender and fleet, yet his ears are long and ass-like; he has narrow hoofs, and a tail with a tuft at the end like all the ass tribe; his color is a yellow brown, and he has a short dark mane and a long dark stripe down his back as a donkey has. Living often on the high plateaus, sometimes as much as fifteen hundred feet above the sea, this 'child of the steppes' travels in large companies even as far as the rich meadows of Central Asia; in summer wandering in green pastures, and in winter seeking the hunger-steppes where sturdy plants grow. And when Autumn comes the young steeds go off alone to the mountain heights to survey the country around and call wildly for mates, whom, when found, they will keep close to them through all the next year, even though they mingle with thousands of others.

"Till recent years the *Equus hemionus* was the only truly wild horse known, but in the winter of 1879-80 the Russian traveler Przhevalsky brought back from Central Asia a much more horse-like animal, called by the Tartars kertag, and by the Mongols statur. It is a clumsy, thick-set, whitish-gray creature with strong legs and a large, heavy, reddish-colored head; its legs have a red tint down to the knees, beyond which they are blackish down to the hoofs. But the ears are small, and it has the broad hoofs of the true horse, and warts on the hind legs, which no animal of the ass tribe has. This horse, like the kiang, travels in small troops of from five to fifteen, led through the wildest parts of the Dsungarian desert, between the Altai and Tian-Shan Mountains, by an old stallion. They are extremely shy, and see, hear, and smell very quickly, so that they are off like lightning whenever anything approaches them.

"So having traveled over America, Europe, and Asia, was my quest ended? No; for from the dreary Asiatic deserts my thoughts wandered to a far warmer and more fertile land, where between the Blue Nile and the Red Sea rise the lofty highlands of Abyssinia, among which the African wild ass, the probable ancestor of our donkeys, feeds in troops on the rich grasses of the slopes, and then onward to the bank of a river in Central

Africa where on the edge of a forest, with rich pastures beyond, elephants and rhinoceroses, antelopes and buffaloes, lions and hyenas, creep down in the cool of the evening to slake their thirst in the flowing stream. There I saw the herds of zebras in all their striped beauty coming down from the mountain regions to the north, and mingling with the darker-colored but graceful quaggas from the southern plains, and I half grieved at the thought how these untamed and free rovers are being slowly but surely surrounded by man closing in upon them on every side.

"I might now have traveled still farther in search of the onager, or wild ass of the Asiatic and Indian deserts, but at this point a more interesting and far wider question presented itself, as I flung myself down on the moor to ponder over the early history of all these tribes.

"Where have they all come from? Where shall we look for the **first** ancestors of these wild and graceful animals? For the answer to this question I had to travel back to America, to those Western United States where Professor Marsh has made such grand discoveries in horse history. For there, in the very country where horses were supposed never to have been before the Spaniards brought them a few centuries ago, we have now found the true birthplace of the equine race.

"Come back with me to a time so remote that we cannot measure it even by hundred of thousands of years, and let us visit the territories of Utah and Wyoming. Those highlands were very different then from what they are now. Just risen out of the seas of the Cretaceous Period, they were then clothed with dense forests of palms, tree-ferns, and screw-pines, magnolias and laurels, interspersed with wide-spreading lakes, on the margins of which strange and curious animals fed and flourished. There were large beasts with teeth like the tapir and the bear, and feet like the elephant; and others far more dangerous, half bear, half hyena, prowling around to attack the clumsy paleotherium or the anoplotherium, something between a rhinoceros and a horse, which grazed by the waterside, while graceful antelopes fed on the rich grass. And among these were some little animals no bigger than foxes, with four toes and

a splint for the fifth, on their front feet, and three toes on the hind ones.

"These clumsy little animals, whose bones have been found in the rocks of Utah and Wyoming, have been called *Eohippus*, or horse of the dawn, by naturalists. They were animals with real toes, yet their bones and teeth show that they belonged to the horse tribe, and already the fifth toe common to most other toed animals was beginning to disappear.

"This was in the Eocene Period, and before it passed away with its screw-pines and tree-ferns, another rather larger animal, called *Orohippus*, had taken the place of the small one, and he had only four toes on his front feet. The splint had disappeared, and as time went on still other animals followed, always with fewer toes, while they gained slender fleet legs, together with an increase in size and in gracefulness. First one as large as a sheep (*Mesohippus*) had only three toes and a splint. Then the splint again disappeared, and one large and two dwindling toes only remained, till finally these two became mere splints, leaving one large toe or hoof with almost imperceptible splints, which may be seen on the fetlock of a horse's skeleton.

"You must notice that a horse's foot really begins at the point which we call his knee in the front legs, and at his hock in his hind legs. His true knee and elbow are close up to the body. What we call his foot or hoof is really the end of the strong, broad, middle toe covered with a hoof, and farther up his foot we can feel two small splints, which are remains of two other toes.

"Meanwhile, during these long succeeding ages while the foot was lengthening out into a slender limb, the animals became larger, more powerful, and more swift, the neck and head became longer and more graceful, the brain-case larger in front, and the teeth decreased in number, so that there is now a large gap between the biting teeth and the grinding teeth of a horse. Their slender limbs too became more flexible and fit for running and galloping, till we find the whole skeleton the same in shape, though not in size, as in our own horses and asses now.

"They did not, however, during all this time remain confined to America, for, from the time when they arrived at an animal called *Miohippus*, or lesser horse, which came after *Mesohippus*

and had only three toes on each foot, we find their remains in Europe, where they lived in company with the giraffes, opossums, and monkeys which roamed over these parts in those ancient times. Then a little later we find them in Africa and India; so that the horse tribe, represented by creatures about as large as donkeys, had spread far and wide over the world.

“And now, curiously enough, they began to forsake, or to die out in, the land of their birth. Why they did so we do not know; but while in the old world as asses, quaggas, and zebras, and probably horses, they flourished in Asia, Europe, and Africa, they certainly died out in America, so that ages afterward, when that land was discovered, no animal of the horse tribe was found in it.

“And the true horse, where did he arise? Born and bred probably in Central Asia from some animal like the kulan, or the kertag, he proved too useful to savage tribes to be allowed his freedom, and it is doubtful whether in any part of the world he escaped subjection. In England he probably roamed as a wild animal till the savages, who fed upon him, learned in time to put him to work; and when the Romans came they found the Britons with fine and well-trained horses.

“Yet though tamed and made to know his master, he has, as we have seen, broken loose again in almost all parts of the world—in America on the prairies and pampas, in Europe and Asia on the steppes, and in Australia in the bush. And even in Great Britain, where so few patches of uncultivated land still remain, the young colts of Dartmoor, Exmoor, and Shetland, though born of domesticated mothers, seem to assert their descent from wild and free ancestors as they throw out their heels and toss up their heads with a shrill neigh, and fly against the wind with streaming manes and outstretched tails as the kulan, the tarpan, and the zebra do in the wild desert or grassy plain.”

CHAPTER XVII

THE ELEPHANTS, RHINOCEROSES, HIPPOPOTAMUSES, AND WILD SWINE

THERE are three reasons, perhaps, why elephants interest us so greatly.

The first is their enormous size. They are by far the largest of all the animals which live upon land. "Jumbo," for instance, the famous African elephant that we in the United States saw in the last century, was nearly twelve feet in height, and weighed more than six tons. A height of ten feet is quite common.

Next, there is their wonderful docility. When wild, no doubt, they are often very fierce and savage. Yet they are easily tamed; and it is a strange sight to see one of these giant creatures walking about with a load of children upon its back, and meekly obeying the lightest word of a man whom it could crush to death in a moment by simply placing its foot upon him.

And then, once more, there is that marvelous trunk, so strong that it can tear down great branches from the trees, and yet so delicate that it can pick up the smallest scrap of food from the ground. When the elephant wishes to feed, it seizes the food with its trunk and pokes it into its mouth. When it wishes to drink, it fills the same organ with water, and then squirts the contents down its throat. If it should be hot, it can take a shower-bath by squirting water over its body instead. And it breathes through its trunk and smells with it as well. So this wonderful member is used for a great many different purposes.

As it is so valuable, the elephant takes very great care of its trunk, always curling it up out of harm's way, for example, if it should find itself in any danger.

Two different kinds of elephants are known, one of which is found in Africa and the other in Asia.

THE AFRICAN ELEPHANT

You can easily tell the African elephant by the great size of his ears, which are so large that a man might almost hide himself behind one of them. "Jumbo's" ear, indeed, measured no less than five feet five inches from side to side. When the animal is excited these enormous ears stand out at right angles to the head. Then the legs are much longer than those of the Indian elephant, while the trunk, instead of having one finger-like projection at the tip, has two, one in front and one behind. Both the male and female animal, as a rule, possess tusks, while in Indian elephants these weapons are only occasionally present in the male, and hardly ever in the female.

The tusks of the male elephant, however, are always much larger than those of his mate, and sometimes they grow to a very great size. A length of nine feet is not very uncommon, while tusks ten feet long, or even more, have sometimes been recorded. Generally one tusk is several inches shorter than the other, having been worn down in digging for the roots on which the animal is fond of feeding; for elephants seem to dig with one of the tusks only, and never with both.

The ivory of which these tusks are composed is so valuable that the African elephant has been most terribly persecuted, and in many districts where it was formerly plentiful it has disappeared altogether. It lives as a rule in herds, which seek the thickest parts of the forest during the day, and come out at night to search for food and water. And even a small herd of elephants will sometimes do a great deal of damage, for they will uproot trees eighteen or even twenty feet high, in order to feed upon the foliage of the upper branches, or snap off the stems quite close to the ground. When the tree is a large one, it is said that two elephants will unite in breaking it down.

You would think that a herd of elephants would be very conspicuous even in the thick forest, wouldn't you? Yet all hunters unite in saying that as long as they remain still it is almost impossible to see them, while they make their way

through the bushes so silently that even when they are moving it is not at all easy to hear them.

THE INDIAN ELEPHANT

This elephant seldom exceeds nine feet in height at the shoulder, although larger examples are sometimes found. It lives in the thick jungle in herds of forty or fifty, which sometimes wander by night into cultivated ground, and do terrible damage to the crops. Now and then, however, a male elephant will live entirely alone. These solitary animals are always very fierce, and will rush out and attack any one who may pass by. For this reason they are known as "rogues."

The Indian elephant is very often tamed, and is taught to perform all kinds of heavy work, such as dragging timber or piling logs. It is also used for riding, a howdah with several seats being placed upon its back, while it is guided by a native driver, called a mahout, who sits upon its neck and directs its movements by means of a spiked hook. It is largely employed, too, in hunting the tiger. But for this purpose it has to be most carefully trained, for elephants are naturally very much afraid of tigers, and even after a long course of instruction will sometimes take to flight when the furious animal springs at them with open jaws and eyes flaming with rage.

Elephants in India are mostly captured by being driven into a large keddah, or enclosure of stout posts, from which they are unable to make their escape. In this way a large herd of the huge animals are often taken prisoners together.

Next in size to the elephants are the great creatures known as rhinoceroses, which are found both in Africa and in Asia. Five different kinds are known altogether, but we shall only be able to tell you about two.

THE INDIAN RHINOCEROS

In this animal the hide falls into great folds upon the shoulders and in front of the thighs, while there are smaller folds upon the neck and the hind quarters. The sides of the body are marked

with a large number of round projections, sometimes as much as an inch in diameter, which look very much like the rivets in the iron plates of a boiler. When fully grown this animal stands rather over five feet in height at the shoulder.

The Indian rhinoceros has only one horn, which is generally about a foot long. This horn, strange to say, is not connected in any way with the bones of the skull, but is really a growth from the skin, although there is a bony prominence under it on which it is set. By means of a sharp knife, it could be cut away without difficulty. But it is a very formidable weapon, and some of the rhinoceroses with longer horns have been known to rush at a mounted hunter with lowered head, and then to strike upward with such terrible force that the horn has actually pierced the horse's body, and entered the thigh of the rider.

Sometimes a rhinoceros will rush along with its head bent downward so far that the horn cuts a deep furrow in the ground.

This animal is chiefly found in the swampy parts of the great grass-jungles of India. It is very fond of taking a mud-bath, from which it comes out with its whole body thickly caked with clay. This serves as a great protection from flies and other insects, which persecute it terribly, forcing their way under the thick folds of hide at the shoulders and thighs, where the skin is thinner, and driving it nearly mad by the irritation of their bites.

In spite of its great size this rhinoceros is a rather timid animal, and nearly always runs away when it is attacked. But if it is wounded or brought to bay it becomes a terrible foe, charging with fury again and again, and striking savagely with its horn, and sometimes with its tusks as well.

The African rhinoceroses are without the folds of skin which are found in the Indian species, and have two horns on the head instead of one. Sometimes these horns are of very great length. We have seen a walking-stick that might serve a very tall man, which was cut from the core of such a horn.

THE COMMON RHINOCEROS

This is the better known of the two African species, and is found in almost all the wilder districts from Abyssinia to Cape

Colony. It lives in the thickest parts of the forest, breaking away the bushes and the lower branches of the trees so as to leave a clear space perhaps fifteen or twenty feet in diameter. These retreats are called rhinoceros-houses, and the animals remain in them during the heat of the day.

The common rhinoceros is wonderfully quick and active for so large and heavy an animal, and is said to be able to overtake a man riding a fast horse. But it does not seem, as a rule, to be savage in disposition, and very seldom attacks a human foe. One great hunter tells us that although many rhinoceroses have advanced toward him to within twenty or thirty yards, they always ran away if he threw stones at them, or even if he waved his arms and shouted. When wounded, however, they will sometimes attack furiously. But they never think of looking for their enemy in a tree, and if he can climb on to a bough even three or four feet from the ground he is perfectly safe.

THE HYRAX

Oddly enough, one of the animals most closely related to the rhinoceroses is much more like a rabbit, and actually lives in burrows in the ground. This is the hyrax, or coney, as it is called in the Bible, which almost anybody would mistake at first sight for a rodent. Yet when one comes to look at its front teeth he sees at once that instead of having flat, sharp edges, like a chisel, they are pointed; and these teeth do not continue to grow all through life, like those of the rodent animals. And besides this there are several other points in its bodily structure which show us that it really is a relation of the rhinoceroses.

About fourteen different kinds of hyrax are known, some of which are found in Africa, and the others in Arabia, Syria, and Palestine. They all live in rocky districts high up on the sides of mountains, a great number making their burrows close to one another, just as rabbits do in a warren. They are very active and sure of foot, and scamper up and down the sides of the rocks with the greatest ease. It is difficult to watch them, however,

for they are so shy that they will not leave their holes if they think that any one can see them, while they only come out to feed at night and very early in the morning. Sometimes, it is true, they will lie out on the rocks during the day, enjoying the hot sunshine. But one of them is always appointed to act as a sentinel, and as soon as he notices the slightest sign of danger he gives the alarm, and then they all disappear into their holes.

TAPIRS

Very odd-looking animals are the tapirs, which are found both in Central and South America, and also in some of the islands of the Malay Archipelago. They are about as large as donkeys, but look more like very big pigs. On the neck is a short, stiff, upright mane of black hairs, and the upper lip is lengthened out into a kind of trunk, something like that of an elephant, but on a very much smaller scale, and without the odd finger-like organ at the tip.

These curious animals live in thick forests near the banks of great rivers, and come out from their retreats chiefly by night. By constantly traveling backward and forward they make regular pathways through the thickets. They swim very well, and are fond of gamboling in the water, and also of rolling about on the muddy banks. But they are so timid that it is very difficult to watch them; and it is said that they will run away in terror from even a tiny dog.

But if a mother tapir thinks that her little one is in danger she seems to lose all sense of fear, and will even dash at a man and try to knock him down. And if she succeeds she will trample upon him and even bite him, just like the wild swine.

In America the great enemy of the tapirs is the jaguar, which springs upon them unexpectedly, and generally succeeds in tearing them to the ground. But sometimes they manage to escape either by rushing at once into the very thickest bushes, which sweep away their terrible enemy from his hold, or else by plunging into the water, when he is obliged to loose his grip for fear of being drowned.



PACHYDERMS AND TAPIR.

- 1. African Elephant.
- 2. African Rhinoceros.
- 3. East African Hippopotamus.
- 4. Malayan Tapir.

The American tapirs are sooty brown in color, but that which is found in the Malayan Islands is white on the sides and the hinder parts of the body, while the young animal is spotted and streaked with white all over.

THE HIPPOPOTAMUS

The hippopotamus, or river-horse, is perhaps the most awkward and ungainly animal in the world. His huge body almost touches the ground as he waddles clumsily along, while his short stout legs are set so far apart that they actually make a double track through the herbage. So you can easily understand that when a herd of twenty or thirty of these enormous creatures find their way into a plantation they do terrible damage, eating a good deal, and trampling down far more than they eat.

Then what tremendous mouths they have! When they open their jaws wide, their heads really look as if they were splitting in two right down into their necks. And they have a most formidable array of tusks and teeth, arranged in such a manner that they mow down the herbage almost like the blade of a scythe.

The hippopotamus is a native of Africa, and is found in great numbers in many of the rivers and lakes. It spends a great deal of its time in the water, often sinking its body so low that only its nostrils appear above the surface. And it can dive for eight or even ten minutes at a time, without requiring to breathe. When it rises again it generally begins to blow out the exhausted air from its lungs just before reaching the surface, whereby a column of spray is forced up into the air, just as it is by a whale when spouting.

When a mother hippopotamus has a little one, she generally carries it about on her back.

A writer tells us that the first hippopotamus that was ever brought to the London Zoo was caught when it was quite young, on one of the islands in the White Nile. As its mother had gone away to feed, the hunter who found it picked it up in his arms and ran off with it toward the boat. The skin of these animals,

however, is thickly covered with a kind of natural oil, and the result was that the little creature was so slippery that it wriggled out of his arms just as he reached the water's edge, and plunged into the river. But luckily the boat-hook was lying close by, and with this he struck at the escaping animal, gaffed it as one does a fish, and succeeded in capturing it again with nothing more than a wound in its thick skin, which very soon healed. After a great deal of trouble it was safely brought to England, and lived in the Zoo for twenty-nine years.

Another kind of hippopotamus, called the pygmy hippopotamus, is found in Western Africa. It is a very much smaller animal, being only about as big as a good-sized pig.

SWINE

Next on our list come the swine, among the most famous of which is the wild boar.

Until about the middle of the sixteenth century this animal was plentiful in the British Isles, and it is still found commonly in the great forests of Europe. It is one of the fiercest and most savage of animals, for it does not seem to know what fear is, and will attack over and over again, even after receiving the most severe wounds. And its tusks are so sharp and powerful that they have been known to rip up the body of a horse at a single stroke. When removed from the jaw these tusks are generally about eight or nine inches long.

In India, where wild boars are very plentiful, they generally make their lair among thick bushes in some marshy district, and often do a great deal of mischief to cultivated crops in the neighborhood. They are fond of roots, too, which they grub out of the ground with their snouts, and in hot summers, when the ponds dry up, they are said to dig in the mud at the bottom in search of the fish which have buried themselves until the rainy season. The old boars generally live by themselves, like "rogue" elephants, but the younger ones and the sows go about together in droves of fifteen or twenty, all of which, most likely, are members of the same family.

THE BABIRUSA

This is one of the most curious of the swine. It is found in the islands of Celebes and Borneo. In the boar of this animal the tusks in both jaws spring upward, and then curve toward the eyes, so that there is a sort of fringe, as it were, of tusks all round the face. Sometimes the upper pairs are thirteen or fourteen inches long, without counting the part that is buried in the jaw. These, however, are not very useful as weapons. But very severe wounds can be inflicted by the lower tusks, although they are a good deal smaller, and an enraged babirusa is a most formidable foe.

When fully grown, the babirusa stands about three feet six inches in height in the middle of the back, which is always very much arched. The color of the skin is dark ashy gray.

THE WART-HOG

The wart-hog, or vlack-vark, which is found in Eastern Africa, is certainly the ugliest of all the swine. Its head is enormously large in comparison with its body, the muzzle is very long and broad, under each eye is a great wart-like lump, with two others a little distance below it, and on each side of the mouth two great stout tusks spring upward. Altogether, it would be very hard to imagine a more sullen and ferocious-looking animal.

It is not nearly so savage as the babirusa, however, and if it is attacked it nearly always runs away, and tries to take refuge in some hole in the ground, such as the deserted burrow of an ant-bear. When it takes to ground in this way, it always turns round just before entering, and backs in tail foremost. Sometimes, if two or three men stand just over the burrow and jump heavily up and down in time together, it can be induced to bolt. But it is advisable to do so with a good deal of caution, for the animal has a singular way of turning a kind of back somersault just as it leaves its burrow, which lands it upon the top, just where the hunters would most likely be standing. And if they

are not very careful one of them at least is almost sure to receive a slashing cut from the terrible tusks, which will certainly cause a severe wound, and may even render him a cripple for life.

When it is running away from a pursuer, and wishes to see whether it is gaining upon him, the wart-hog presents a most ridiculous appearance, for its neck is so short that it cannot turn its head round to look behind it. So it lifts its snout straight up into the air instead and looks over its shoulders. Besides this, it always carries its tail perfectly stiff and upright.

PECCARIES

In South America, and in Mexico and western Texas, the wild swine are represented by the peccaries, of which there are two different kinds, the collared peccary and the less common white-lipped peccary. They are not very large animals, being only about three feet in length, and weighing not more than fifty or sixty pounds; but they are nevertheless very dangerous creatures, for three different reasons.

In the first place, they travel about in packs, sometimes consisting of thirty or forty animals, which all attack a foe together. In the second place, although their tusks are not nearly so long as those of the preceding animals, they are almost as sharp as razors, and can inflict most terrible wounds. Thirdly, the animals know no fear, and will go on savagely attacking any enemy, over and over again, until the last of them is killed. So if a hunter should meet with a herd of peccaries in the forest, even if he be armed with a gun, his only chance of escape is to climb into a tree and to stay there till they go away.

When a herd of peccaries is not very large—consisting, perhaps, of only ten or twelve individuals—they are very fond of taking up their abode in the hollow trunk of some fallen tree. In this case they can be very easily destroyed, for one animal is always placed at the entrance to act as a sentinel; and if a hunter conceals himself in some convenient place close by, takes careful aim, and shoots the watching peccary dead upon the spot, the animal behind him will just push out his carcass and take his

place, to be himself shot in like manner. In this way the whole herd may be killed one after another.

Peccaries will eat almost any kind of food, and though they live as a rule in the thickest parts of the forests, they will often wander to long distances in order to feed upon the crops in cultivated ground. There they sometimes do an immense amount of damage, and as they generally come during the night, and leave again before daybreak, it is very difficult to trap or shoot them.

CHAPTER XVIII

EDENTATES, OR TOOTHLESS MAMMALS

THE animals which belong to this order are distinguished by having no front teeth, while some of them have no teeth at all. And in many other ways they are very curious and interesting creatures.

SLOTHS

The sloths live almost entirely in the trees, scarcely ever descending to the ground. Not only that, they walk along underneath the branches instead of upon them, suspending themselves by means of their great hooked claws. So they actually spend almost the whole of their lives upside down, with their backs toward the ground!

Yet they manage to travel along from bough to bough and from tree to tree with some little speed, and when there is a high wind, so that the branches are blown together, they will often wander for long distances. And they never seem to get tired, although even during the night they still hang suspended, just as they do during the day.

Sloths are very odd-looking creatures, and if you were to see one of them hanging from a bough in its native forests you would find it rather hard to believe that it was really an animal at all. For it looks much more like a bundle of twigs overgrown with lichens. And the strange thing is that it really is covered with lichens, which grow upon its long, coarse hairs just as they do on the twigs of the trees. These give the fur of the sloth a curious green appearance, which disappears soon after death, so that one never sees it in a stuffed specimen in a museum.

When a sloth is hungry, there is always plenty of food close

by, for it feeds only upon the leaves and fruits and the tender young shoots of trees. And as there is plenty of moisture in these, it never requires to drink at all.

There are two different groups of these singular animals, the first consisting of those which have three toes on the front feet, and the other of those which have only two. They are only found in the great forests of Central and South America.

ANT-EATERS

Equally curious, although in quite a different way, are the ant-eaters, or ant-bears, as they are sometimes called, the largest of which is the great ant-eater of tropical America.

When fully grown this animal is about four feet long, without counting the tail, while it is about two feet high at the shoulder. And it has two strange peculiarities.

In the first place, its head is drawn out into a kind of long, narrow beak, with the little round nostrils at the very tip. Then its tongue is very long and worm-like, and is exceedingly sticky, so that when it is swept to and fro among a number of ants, or other small insects, hundreds of them adhere to it and are carried into the mouth. This is the way in which the animal feeds, and if you go to look at the ant-eater in a zoo you may often see it poke its long tongue down between the boards at the bottom of its cage and bring up a cockroach which had vainly been seeking a place of refuge.

The other peculiarity is the enormous size of the tail, the hair of which is so long that when it is carried over the back it completely covers the whole of the body, and makes the animal look just like a haystack.

On its front feet the great ant-eater has very strong curved claws, with which it tears open the nests of the insects on which it feeds. When it is walking, of course, these claws are rather in its way, and it is obliged to tread on the sides of its feet instead of on the soles. But it manages, nevertheless, to shuffle along with some little speed, although its movements are very far from being graceful. And sometimes it uses them as weapons, for while it always tries to hug an enemy with its power-

ful forearms and squeeze him to death, the claws often enter his body and inflict a serious or even a fatal wound.

When a mother ant-eater has a little one to take care of, she always carries it about on her back, and only allows it to get down just now and then in order to feed.

There is another kind of ant-eater called the tamandua, which lives in the trees and has a prehensile tail, just like that of a spider-monkey. It is much smaller than the great ant-eater, and has a shorter and stouter head, while its tail is scarcely as bushy as that of a Persian cat. In color it is yellowish white, with a broad black patch which runs from the neck to the hind quarters, and then widens out so as to cover the whole of the flanks. The tip of the snout is also black. The animal, like the preceding, is a native of tropical America.

THE ARMADILLOS

These are remarkable for having their bodies almost entirely covered by a kind of natural armor, which consists of several bony plates growing in the skin. There are three of these plates altogether, one covering the head and shoulders, another protecting the back, while the third clothes the hind quarters. And they are fastened together by means of bony rings, so that when the animal rolls itself into a ball no gap is left between them. You know what a milleped or thousand-legs looks like when it rolls itself up, don't you? Well, imagine a thousand-legs as big as a football, and you will have a very good idea of an armadillo.

These animals do not appear to be in the least inconvenienced by their singular armor, and are able to run with considerable speed. They are able to dig very well, too, by means of the large and powerful claws with which their front feet are furnished, and it is said that if a man on horseback sees an armadillo running by his side, and leaps to the ground to secure it, he will nearly always find that it has succeeded in burying itself before he is able to seize it.

The six-banded armadillo is so called because the horny plate upon its back is broken up into six separate bands, all of

which, however, are closely linked together by bony rings. Sometimes it is called the weasel-headed armadillo, because its head is thought to be rather like that of a weasel. It is about sixteen inches in length, without including the tail, and is found in Brazil and Paraguay.

The giant armadillo is very much larger, growing to the length of nearly a yard from the tip of the snout to the root of the tail. It lives in Brazil and Surinam, and feeds chiefly on ants and termites.

One of the most interesting of these creatures is the odd little *pichiciago*, which is only about five inches long, and has a pink shield upon its back, and fur of snowy white. It is found in the western parts of the Argentine Republic, in open sandy places, but nowhere seems to be very plentiful. It digs in a most curious manner. First of all, it scratches away for a minute or two with its front feet, just to loosen the soil. Then, supporting itself partly on its front feet and partly on its tail, it uses the hind feet with the most astonishing rapidity, so that it sinks down into the ground as if by magic. And, strange to say, it does not leave its burrow open behind it when it has gone in, but carefully closes the entrance, ramming the earth hard by means of the bony shield at the end of its body.

PANGOLINS

Among other animals called ant-eaters are the pangolins, which are more remarkable still. They are called scaly ant-eaters, because their heads, bodies, and tails are covered with large, pointed oval scales, which overlap one another very much like the tiles on the roof of a house. When they are alarmed they coil themselves up into balls, just as most of the armadillos do, and their muscles are so wonderfully strong that it is quite impossible to unroll them.

Seven different kinds of pangolins are known, four of which live in Africa, and three in Asia. They all feed chiefly upon ants and termites, which they catch by breaking down the walls of their nests, and licking up the insects with their long, worm-like tongues as they run about in confusion. They live either

in crevices among rocks, or else in burrows which they dig for themselves in the ground. Sometimes these burrows are of very great size, that of the Indian pangolin often running for ten or twelve feet downward into the ground, and having at the end a sleeping-chamber at least five or six feet in diameter.

When a pangolin comes to the edge of an overhanging rock, and wishes to descend to the ground below, it coils itself up into a ball and then rolls over, alighting on the edges of its scales just as a hedgehog does upon its spines. In this way it can drop ten or fifteen feet without receiving any injury.

The different species of pangolin vary a good deal in size, but the largest of them, the giant pangolin, is between four and five feet long when fully grown, including the tail.

THE AARD-VARK

This name means earth-pig, and has been given to the animal by the Boers of South Africa, because in general appearance it is rather like a pig. But then it has ears like those of a hare, and a muzzle and tongue like those of an ant-eater, while all its feet are furnished with long and stout claws. So that altogether it is a very odd-looking creature.

The aard-vark feeds entirely upon termites and ants, and is nearly always to be found where the nests of those insects are plentiful. It digs with great rapidity, and is said to be able to burrow into the ground faster than a man armed with a spade can dig it out. So it has no difficulty in tearing a hole through the walls of the termites' and ants' nests, and then it licks out the insects in thousands.

During the daytime the aard-vark is hardly ever to be seen, for it lies fast asleep in its burrow, which it seldom leaves till after sunset. Before digging this burrow, it mostly scoops out quite a number of half-finished ones, scraping a hole two or three feet in depth, and then leaving it and beginning on another. Why it does this nobody seems to know.

In former days it was thought that the lion and the elephant were in the habit of hunting the aard-vark together, the elephant

flooding its burrow, by means of a stream of water from his trunk, and the lion pouncing upon the animal as it ran out.

When fully grown the aard-vark is rather over six feet in total length, about one third of which is occupied by the tail. The body is very heavily and clumsily built, and the back is a good deal arched in the middle. In color it is yellowish brown, with a tinge of red on the back and sides, while the lower surface is rather paler.

CHAPTER XIX

THE MARSUPIALS

THE last order of mammals is a very curious one, for in most of the animals which belong to it there is a large pouch on the lower part of the body of the female, in which she carries her little ones about for several weeks, or even several months, after they are born. That is why these creatures are called marsupials, for marsupial means pouched. Even after the little animals are quite able to take care of themselves they will hurry back to their mother and jump into her pouch in moments of danger.

It is quite true that in a good many marsupials this pouch is wanting. But traces of it are almost always to be found, although sometimes they are so slight that only a very careful observer would be likely to notice them.

In earlier days marsupial animals lived in almost all parts of the world, for there are very few countries in which their fossil remains have not been discovered. But now they are almost entirely restricted to Australia, the only exceptions being the opossums, which are found in America.

KANGAROOS

The largest, and in some respects the most interesting, of the marsupials are the kangaroos. In some ways they are rather like gigantic hares. But their front legs are so much smaller than the hinder ones that they cannot run on all fours, but travel by means of a series of leaps, skipping about, in fact, instead of running. And besides this they have very long and stout tails, which serve to support them when they are sitting upright, and also help them to balance their bodies when they are leaping.

The male kangaroo, which is often known as the "boomer," or as the "old man," is very much larger than the female, sometimes attaining to a total length of eight feet six inches, or even

nine feet, nearly half of which is occupied by the tail. But when he is sitting upright he is nearly as tall as a tall man. The female is about two feet shorter.

Although it is obliged to hop along instead of running, the kangaroo is a very swift animal, and can only be run down by fast and powerful dogs. At every leap it covers about fifteen feet of ground, the distances between the holes which its great claws make in the ground being as regular as if they had been marked out with a measuring-tape.

These huge claws are very formidable weapons, and the kangaroo well knows how to use them. As a rule it is a very timid animal, and when it is attacked its first idea is always to seek safety in flight. But if it is driven to bay it takes up its post with its back against a tree, so that it cannot be approached from behind, and quietly awaits the onslaught of its enemies. Then, as soon as one of them comes within reach, it kicks suddenly out with one of its hind feet, delivering its stroke with such force that the great sharp claw has been known to rip up the body of a large dog from end to end, and to stretch the poor beast dying upon the ground. For this reason hounds which are used in kangaroo-hunting are made to wear collars of twisted steel chain, to protect them from the stroke of their quarry.

Sometimes, too, when a hunted kangaroo finds that it cannot escape simply by speed, it will wade into a pool or river, wait till the dogs swim up to it, and then seize them with its fore limbs one after another, and hold them under water till they are drowned. Although they are not large, these front limbs are wonderfully strong, and if even a powerful man were to be embraced by them he would find it very difficult to make his escape.

The female kangaroo, however, is not nearly so well able to defend herself, and sometimes she has been known, when chased by hounds, to lie down and die simply from fear. But sometimes she escapes by taking a sudden leap sideways into thick bushes, lying perfectly still until her pursuers have rushed past her, and then making off in the opposite direction.

As the mother kangaroo hops about, the head of her little one, or "joey," as it is called, may often be seen poking out of her pouch. And she is so clever that if an enemy should appear

when the "joey" is playing on the ground or feeding, she will snatch it up and put it into her pouch even while she is hopping away, without pausing for a moment in her retreat.

A JOYOUS MEETING

Kangaroos are very affectionate animals, and a touching story is told of a couple which lived together in captivity. They became the very best of friends, but when they were sent from Australia to Philadelphia, they had to travel by different ships. As soon as they were separated, they became miserable, moping in their cages, refusing to take food, and calling for each other all day long. "Jack," as the male was called, reached Philadelphia first, and for a whole week seemed to be constantly on the watch to see if "Flora," his mate, was coming. At last she arrived, and both animals at once became madly excited, leaping in their cages so wildly that at last they were put together, to prevent them from injuring themselves against the bars. Then they cuddled up against one another, licked each other with their tongues, and seemed so overjoyed to meet that the keeper promised that they should never be parted again.

VARIOUS SPECIES OF KANGAROOS

Kangaroos generally live in droves, sometimes consisting of only a few animals, sometimes of as many as a hundred and fifty, or even more. But a "boomer" often lives during the greater part of the year quite alone, like a "rogue" elephant.

There are at least twenty-three different kinds of kangaroos, the smaller ones being generally known as wallabies. And these are again divided into large wallabies and small wallabies.

The large wallabies are also called brush-kangaroos because they live in the thick brushy jungle, called the bush, which occupies so large a part of the Australian continent. The biggest of them is really quite a large animal, for when fully grown it is six feet long, from the tip of the muzzle to the end of the tail. Some of the small wallabies, however, are very small, several of them being no bigger than rabbits.

Then there are some of these animals which spend most of their life in the trees and are called tree-kangaroos. Four of these creatures that lived for some time in the London Zoo looked very odd as they sat on the branches with their long tails hanging down behind them. But even when they were on the floor of their cage one could not possibly mistake them for ground-kangaroos, for their front limbs were almost as long as their hind ones.

The best known of these animals is found in Queensland. It spends the day in sleep, only coming out from its retreat among the foliage when darkness has set in, and it lives in the very thickest part of the bush, which is hardly ever visited even by the natives. It does not seem to be a very good climber, for it is rather slow in its movements, and appears to be a little afraid of falling; for it clings so tightly to the branch on which it is resting that it is difficult to force it to loose its hold.

The natives generally catch this curious kangaroo by climbing the tree in which it is sleeping, jerking it from its perch by a violent pull at its tail, and throwing it to the ground to be killed by the dogs below. But if it reaches the ground unhurt it makes off with great speed, hopping along with flying leaps like all the other members of the family.

KANGAROO-RATS

These animals, often called potoroos, are quite small, even the largest of them being scarcely as big as a rabbit. They do not jump so well as the true kangaroos, and generally run on all fours in a kind of gallop. But when they are at rest they sit upright on their hind quarters.

One of these animals, known as the brush-tailed bettong, puts its tail to a most curious use. It makes its nest of grasses and leaves in a hollow in the ground, and when it is collecting materials for building, it gathers them up into a bundle, twists the tip of its tail round them, and then hops swiftly away, holding its little sheaf well away from its body. It is a most clever little builder, for when it has chosen a suitable hollow in the ground for its nest, it first of all enlarges it until it is big enough for its

requirements, and then weaves its materials carefully together until the top of its little home is just on a level with the herbage growing all round it. And whenever it goes in or out, it pulls a tuft of grass over the entrance in order to prevent it from being noticed. So well is the nest concealed, that you might pass within a few feet and look straight at it without seeing it.

This animal is also sometimes known as the jerboa-kangaroo.

THE SUGAR-SQUIRREL

Among the Australian mammals we find a good many which are really very much like those found in other parts of the world, and might easily be mistaken for them if it were not for the presence of the marsupial pouch. One of these is the curious sugar-squirrel, or squirrel-petaurist, which is really very much like the flying squirrels of Asia and North America. It has the skin of the sides and flanks developed in just the same manner, and uses it in exactly the same way, leaping from a lofty bough, spreading its limbs at right angles to its body so that the skin is stretched out between them, and thus contriving to skim for long distances through the air. And the big, bushy tail serves partly to help it in keeping its balance, and partly to enable it to keep a straight course.

During the daytime sugar-squirrels are nearly always asleep in a hollow tree, or in some other convenient retreat. But as soon as it grows dark they all come out from their hiding-places and begin to frisk about, and to leap from tree to tree, with the utmost activity. After a time they will stop, in order to search for insects, or to feast upon the honey which they find in the blossoms of the trees. But very shortly they recommence their gambols, and so they go on, alternately playing and feeding, till the dawn.

The sugar-squirrel is a very pretty little creature, the fur being brownish gray above, with a black stripe along the back, and a rich brown edging to the umbrella-like skin of the sides. The lower parts of the body are nearly white, and the tail is brown above and white beneath. In length it is about nineteen or twenty inches, rather more than half of which is occupied by the tail.



TYPES OF MARSUPIALS

1. Australian Sugar Squirrel.
2. American Opossum.
3. Australian Echidna.
4. Australian Great Kangaroo.
5. Tasmanian Devil.

AUSTRALIAN BEAR

There is an animal, much like a small bear, that is often known as the Australian bear, although its proper name is the koala. When fully grown it is about as big as a poodle. It has a stoutly built body, very short legs, large and almost square ears, with a fringe of stiff hairs round the edges, and no visible tail, while the fur is very thick and woolly. In color it is ashy gray above and yellowish white under the body.

The koala spends most of its life in the trees. Yet it is not a very good climber, for its movements are curiously slow, and it always seems to feel in danger of falling. On the ground it is slower and more awkward still, for its feet are much more suited for grasping a branch than for use upon a level surface. But it does not often come down from the trees unless it wishes to drink, or to vary its diet of leaves and buds by digging for roots.

When a mother koala has a little one to take care of, she always carries it about on her back, and even when it is nearly half as big as she is it may sometimes be seen riding pickaback.

The koala is a very gentle animal, and even when it is captured it seldom attempts to scratch or bite. But sometimes it gets in a great passion over nothing at all, and shows its teeth and yells and screams in such a threatening manner that any one who did not know how harmless it really is would most likely be afraid of it.

Owing to the fact that it spends so much of its life in the trees, this animal is sometimes called the Australian monkey; and it is curious to find that it has pouches in its cheek in which it can store away food, just as many of the true monkeys have.

THE WOMBAT

The wombat might easily be mistaken for a rodent, for its front teeth are formed almost exactly like those of the rabbit and the rat. But as it possesses a marsupial pouch, there can be no doubt of the order it really belongs to. It is not at all a handsome animal. In fact, it is fat, awkward, clumsy, and heavy—

something like a much overgrown guinea-pig—and it seems to spend its whole life in eating and sleeping. It can dig very well, however, and makes deep burrows in the ground, with a large sleeping-chamber at the end. If in captivity, it will often make its escape by digging its way out under the walls.

When fully grown the wombat is about three feet in length, and its legs are so short that its body almost touches the ground as it waddles awkwardly along. Like the koala, it is very gentle in disposition, and hardly even struggles when it is captured, although it is subject to sudden fits of passion. If it is kept as a pet, it soon becomes very affectionate, and likes to go to sleep on its owner's knees, like a cat.

In color this animal is dark grayish brown. It is found in New South Wales, Victoria, and South Australia.

THE BANDICOOTS

There are about a dozen different kinds of these very odd-looking animals. Perhaps we can best describe them by saying that if you can imagine a rat with a snout drawn out like that of a shrew, very large ears, three very long toes with still longer claws on each foot, together with two toes with no claws at all, and a rather short, hairy tail—then that is what a bandicoot looks like.

Owing to the very odd way in which their feet are formed, bandicoots cannot run like other animals, but travel along by means of a curious mixture of running and jumping. They are common in most parts of Australia—so common, in fact, that they are generally regarded as a great nuisance. For they do a terrible amount of mischief both in gardens and in cultivated fields, feeding both upon grain and fruits, as well as upon the roots and bulbs which they scratch up out of the ground. During the daytime they are hardly ever seen, for they hide away in holes in the ground, or in hollow trees, and remain fast asleep till after sunset. Some of them, however, make nests of dry leaves and grasses which are so cleverly concealed among the herbage that it is very difficult to find them.

THE TASMANIAN WOLF

There are certain marsupial animals which look as though they belonged to the dog and cat tribes. They are called dasyures, and are beasts of prey. One of these is the Tasmanian wolf, or thylacine, as it is often called, which is so wolf-like both in appearance and habits that it fully deserves its name. But you can tell it from the true wolves at a glance by the dark, zebra-like stripes upon its back, and also by its long slender tail, which tapers down almost to a point. It is also known as the zebra-wolf and the tiger-wolf.

The Tasmanian wolf used to be very common indeed, for it was the most powerful of all the Tasmanian animals, so that it had no natural foes, while it was very seldom killed by the natives. But when white settlers came to live in the country they found that it killed so many of their sheep that it was necessary for them to do all that they could to destroy it. So numbers of Tasmanian wolves were shot, and numbers more were caught in traps, and by degrees the animal was driven back, until now it is only found in wild and rocky districts among the mountains, which are scarcely ever trodden by the foot of man.

There are very few of the Australian animals which do not fall victims to this fierce and savage creature. Even kangaroos are killed by it at times. And it has been known to destroy and devour the echidna, which is something like a small porcupine. But besides feeding upon living prey, it will feed heartily upon any carrion that it may find, and will also prowl about on the sea-shore in search of the various dead animals which are flung up by the waves.

The Tasmanian wolf is a nocturnal animal, remaining hidden all day long in some deep recess among the rocks, into which no ray of sunshine can ever penetrate. It does not like the daylight at all, and seems most uneasy if it is brought out from its retreat. And, strange to say, it has a kind of inner eyelid, which it draws across its eyes every moment or two in order to keep out the light as much as possible.

THE TASMANIAN DEVIL

Just as the Tasmanian wolf is like a dog, so the Tasmanian devil is like a small bear—and a very wild, fierce, savage bear, too. Its name has been given to it on account of its disposition, and there is perhaps no animal which it is so difficult to tame. No matter how kindly it is treated, it is always sullen and always ferocious. It will fly at the very hand that gives it food. If you merely look at it as it lies in its cage, it will dash furiously at the bars with its teeth bared, uttering yells and screams of passion. You cannot help feeling that it would tear you to pieces if only it had the chance. And its teeth are so sharp and its jaws are so powerful, that there are very few dogs which could overcome it in fair fight.

The Tasmanian devil has its eyes protected just as the Tasmanian wolf has, and like that animal it is seldom seen abroad by day. It is extremely mischievous, for night after night it will visit the hen-roosts and the sheepfolds, not only preying upon the poultry and the young lambs, but seeming to kill for the very sake of killing. So it has been almost as greatly persecuted as the Tasmanian wolf, and has altogether disappeared from many districts where it used to be plentiful, while in many others it is very seldom found.

In size the Tasmanian devil is about as big as a badger, and in color it is dull sooty black, with a white collar-like streak on the lower part of the throat.

Then the larger dasyures may be compared to cats, to which they are just about equal in size. In Tasmania, indeed, they are called wild cats. They live in trees, sleeping in hollows in the trunks during the day, and prowling about in search of prey by night. And they are almost as mischievous in poultry yards as the Tasmanian devil. But then, on the other hand, They will learn to catch rats and mice if they are tamed and trained, just as a cat will.

There are several different kinds of these animals, but they all agree in having grayish or grayish-brown fur, with a number of white spots on the sides of the body.

POUCHED MICE

Very pretty and graceful little creatures are these. There are a good many different kinds of them. They are all small, the largest of them being no bigger than a half-grown rat, while some of them are not equal in size even to an ordinary mouse. And as they breed very freely, and have quite a number of little ones at every birth, they are among the most plentiful of all the Australian mammals.

Pouched mice always spend much of their time in the trees, where they seem quite as contented as they do on the ground. They run up and down the trunk with the greatest activity, scamper along the branches, leap from one bough to another, and never seem to miss their footing. And they are continually poking their sharp little muzzles into the cracks and crevices of the bark in order to search for tiny insects and spiders. Their habits are not very much like those of mice, and one cannot help thinking that they ought to be called pouched shrews.

THE MYRMECOBIUS, OR BANDED ANT-EATER

This marsupial ant-eater is found in Southern and Western Australia. It is a prettily marked little animal of about the same size as a squirrel, with a pointed snout, a long slender body, and a rather long and bushy tail. In color it is dark chestnut brown above and white below, while a number of white stripes run across the hinder part of the back and loins, beginning just behind the shoulders, and ending a little above the root of the tail.

The myrmecobius lives principally on the ground. But it is a very good climber nevertheless, and can ascend trees and run about on the branches with considerable activity. It feeds on ants and termites, catching them by means of its long and worm-like tongue, which is so sticky that the insects adhere to it as soon as they are touched. The marsupial pouch is almost entirely wanting, so that one might almost be led to

suppose that the animal must be a true ant-eater. But then the ant-eaters have no teeth at all, while the myrmecobius has no less than fifty-two, or more than any other mammal with the exception of one or two members of the whale tribe and the armadillo.

This curious and pretty little animal is very gentle in disposition, and never seems to bite or scratch even if it is taken prisoner. It makes its home either in the decaying trunk of a fallen tree, or else in a hole in the ground.

THE POUCHED MOLE

This, one of the most curious of all the marsupial animals, was quite unknown until a recent time. In size and shape it is very much like the common mole, and it has its fore paws armed with enormous claws for digging in just the same manner. In color it is pale yellow. It has no outward ears, and its eyes are so tiny, and so deeply buried in the skin, that it must be almost, if not quite, unable to see with them. And in front of its snout is an odd kind of shield made of thick, horny skin, which is evidently intended to protect the face as the animal forces its way through the ground.

This singular creature lives in sandy districts in the deserts of South Australia. It appears to burrow through the soil for a few feet, then to come to the surface and crawl for a little distance, and then to burrow again. And as it creeps over the sand it leaves three tracks behind it, one being made by the feet on either side, and the third by the stiff and stumpy little tail, which appears to be pressed down upon the ground. These tracks, of course, can only be seen after rain, for in dry weather the sand very soon falls in upon them, and fills them up.

OPOSSUMS

The next group of the marsupial animals is found, not in Australia, but in America.

There are several different kinds of opossums, most of which live in the trees. They are excellent climbers, for they not only

have their hind feet made more like hands, with a thumb-like great toe which enables them to grasp the branches, but are also the possessors of long prehensile tails, like those of the spider-monkeys. So powerful is the tail of an opossum that it can bear the entire weight of the body as the animal swings from a branch to pluck fruit which would otherwise be out of its reach.

But opossums do not feed upon fruit alone. Indeed, there are very few things which they will not eat. They are very fond of maize, or Indian corn, for example, obtaining it sometimes by climbing up the stems of the plants, and sometimes by cutting them down close to the ground. Nuts, too, they devour in great quantities, together with acorns and berries. Sometimes they dig up roots out of the ground. Then they will search for birds' nests, and carry off the eggs or the unfledged little ones. They will pounce upon a rabbit, too, or a young squirrel, and do not disdain mice, or lizards, or frogs, or even insects. And the farmer has very good cause for disliking them, for they not only get into his fields and steal his grain, but find their way into his hen-roosts and carry off the eggs and the young chickens.

But then they are very easily caught, for they are attracted by any kind of bait, and will walk into the simplest of traps. Yet in some ways they are exceedingly cunning. If they are caught, for example, and are injured in even the slightest degree, they will pretend to be dead, and will allow themselves to be pulled about, or kicked, or beaten, without showing any sign of life. Then the moment they think that no one is looking at them they will rise to their feet and quietly slink away. From this we get the proverb "playing possum."

During the daytime the opossum is usually fast asleep in its nest, which is sometimes made by itself, and sometimes is the deserted home of a squirrel. So it has to be hunted by night.

A moonlight night is always chosen for this purpose, and the animal is first of all driven into a tree by dogs. One of the hunters then climbs the tree and shakes it down from the branch to which it is clinging, and the moment it reaches the ground it is pounced upon and destroyed by the dogs.

The opossum runs in a very curious manner, moving both limbs of the same side together.

When the little opossums are born, they are not only blind, like puppies and kittens, but are quite deaf as well, and do not get their sight and hearing for some little time. They remain hidden all of their infancy in the mother's pouch, staying there five or six weeks, and afterward riding about on her back.

The common opossum is about as big as a cat. But it looks much more like a very big rat, for its tail is long and scaly. It is found in North America. In South America there is a different species, called the crab-eating opossum, because it is so fond of the crabs and crayfishes which abound in the salt creeks and the great swamps of Brazil. Then Merian's opossum, in which the marsupial pouch is not developed, has a most curious way of carrying its young about, for the little ones stand in a row on their mother's back, with their tiny tails coiled tightly round hers, to prevent them from falling off. And the yapock opossum spends most of its life in the water, and lives upon fish, being such an excellent swimmer that it is able easily to overtake them.

Last of all, we come to two most extraordinary animals, which differ from all other mammals in the fact that they lay eggs, while in some parts of their skeletons they closely resemble the reptiles.

THE ECHIDNA

The first of these creatures is called the echidna, and is also known as the spiny ant-eater. It is from fifteen to nineteen inches in length, and has the whole upper surface of the head and body covered with a mixture of stiff hairs and short sharp spines, something like those of a hedgehog. The head is drawn out into a very long, slender, beak-like snout, at the tip of which the nostrils are placed, and the tongue is long and worm-like and very sticky, just as it is in the true ant-eaters. The feet are furnished with enormous claws, which are used in tearing open the nests of the insects upon which the animal feeds, and those of the hind feet, strange to say, are turned backward in walking, so that they point toward the tail instead of the head.

These claws are also used in digging, and can be used with such effect that if the animal is surprised when on sandy soil it sinks into the ground as if by magic. But if the ground is so

hard that it cannot use its claws, it rolls itself up like a hedgehog, and trusts to its spiny coat for protection.

The common echidna is found in Australia, Tasmania, and New Guinea. Besides this there is another species, called the three-toed echidna, which is found in New Guinea only.

THE DUCKBILL

Even more curious still is the duckbill, or duck-billed platypus, which not only lays eggs like a bird, but resembles a bird in several other ways as well.

It has a bill, for example, just like that of a duck—broad and flat, with a number of grooves round the edges. And it feeds by taking a beakful of mud from the bottom of a pond or ditch, squirting out the mud itself through the grooves, and then swallowing the grubs and other small creatures which are left behind.

Then its feet are like those of a duck, the toes being joined together by webbing, so that they can be used as paddles. And even the tail is rather like that of a duck, for it is very broad and flat, so that it can serve as a rudder when the animal is swimming.

This remarkable creature is found in Southern and Eastern Australia, and also in Tasmania. It is not at all uncommon, but is seldom seen, for it spends most of its time in the water, or else in its burrow, which is always made in the bank of a pool or stream. This burrow is generally a long one, running to a distance of forty or even fifty feet, and terminates in a large chamber, which is used as a nursery. And it always has two entrances, one below the surface of the water and one above, so that if the animal is alarmed in any way it can run in by one door and out again by the other.

Two eggs are laid by this most curious creature. They measure about three-quarters of an inch in length, and are enclosed in a tough white shell. How they are hatched nobody seems quite to know; but when the little ones first make their appearance they are quite blind and quite naked, and have hardly any beaks at all.

When fully grown the duckbill is about eighteen inches long from the end of the snout to the tip of the tail.

BIRDS

CHAPTER XX

BIRDS OF PREY

WE have now first to think of the great class of the birds, which are distinguished from all other living creatures by having their bodies covered with feathers.

These feathers serve a double purpose.

In the first place, they help to preserve the warmth of the body. Birds are hot-blooded animals—indeed, their blood is a good deal warmer than ours—and they often have to fly very fast through very cold air. So, you see, it is most important that they should be clothed with some sort of covering which is very warm and at the same time light. And nothing is warmer, and at the same time lighter, than a coat of feathers.

And then, in the second place, many of these feathers are most useful in flight. Without them, indeed, a bird could not fly at all. If we want to keep a tame bird from escaping, we have only to clip its wings, and then it can no longer raise itself into the air. But it is not only the feathers of the wings that are used in flight; those of the tail are employed as well, for they assist in flight, especially in checking speed, and serve as a rudder, enabling the bird to steer its way through the air.

Now birds are divided into orders and tribes and families, just as the mammals are. But scientific men are not quite sure which of the orders ought to be placed first. Among the birds of prey, however, we find some of the largest and finest and most powerful of all the feathered race; so that we cannot do better than place these at the head of our list.

You can always tell a bird of prey by two points in its structure. The first we find in its beak, which is always very large and

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TYPICAL BIRDS OF PREY.

1. Red-tailed Buzzard.
3. Golden Eagle.

2. Sparrow-hawk.
4. Great Horned Owl.

strong, and very sharply hooked. And the second we find in its talons, which are specially made for seizing and killing the animals upon which it feeds. Some persons think that an eagle or a hawk kills its victims with its beak, but that is a great mistake, for the beak is only used for tearing the flesh from off its bones after it is dead. The real weapons are the talons, which are so sharp and so strong that they can be pressed deeply into the vitals of a captured animal and kill it at once. All the birds of prey, therefore, have very powerful legs and large feet and claws.

VULTURES—SYMBOLS OF RAPACITY

First among the birds of prey come the vultures. Yet very often, strange to say, they never kill any prey at all, and the best naturalists suspect that they should be placed in a class by themselves. They much prefer to feed on carrion, so that if they can find the dead body of an animal they will never take the trouble to seek and kill victims for themselves. When an animal dies in a country in which vultures live, several of these birds are sure to find its carcass almost immediately. And in a very short time nothing will be left of it but just the bare skeleton.

So, you see, these birds are really very useful. They belong to the great army of nature's dustmen, just like the jackals and the hyenas. For by destroying these carcasses before they can putrefy, they help to keep the air pure. In the cities of the Southern United States and of the tropics our small American vulture, the turkey-buzzard, is really depended upon as a scavenger.

How vultures find the dead body of an animal is just a little doubtful. Some naturalists have thought that they find it by means of sight, and others that they do so by means of smell. It seems almost certain, however, that when they are hovering high in the air they are really watching one another; so that when one of them sees a carcass and swoops down upon it, all the other vultures within sight notice what he is doing, and come hurrying up for a share in the banquet. This explains how it is that if an animal is killed when not a vulture is

to be seen, quite a number of these great, strong, ravenous birds will make their appearance in a very short time.

THE LAMMERGEIER

This is the finest of all the vultures. It is found in Southern Europe, in Northern Africa, and in Western Asia, and is sometimes as much as four feet in length from the tip of the beak to the end of the tail, while its wings may measure more than ten feet across when fully spread. It is one of the very few vultures which have the head and neck clothed with feathers. Besides this, a curious tuft of bristle-like hairs covers the nostrils, while a similar tuft grows just under the base of the bill. For this reason the bird is sometimes known as the bearded vulture.

Lammergeiers are generally found among high mountains, where they prey upon hares and marmots, and even upon rats and mice. They will visit the flocks, too, which are feeding upon the grassy slopes, and carry off kids and lambs. Chamois, when formerly they were more plentiful than now, used to be attacked by them, and their favorite plan was to swoop down upon them when they were standing on the brink of a precipice, strike them over into the depths below by a stroke of their powerful wings and then descend to feed upon their mangled bodies.

The plumage of the lammergeier is grayish brown above and nearly white below. The feathers of the neck are white, and there is also a pale streak running down the middle of those upon the back.

The lammergeier makes a great clumsy nest of sticks, which is sometimes placed on a ledge of a lofty cliff, and sometimes in the topmost branches of a very tall tree. Two eggs are laid, which are dirty white in color, with brownish blotches.

THE CONDOR

The condor is another very large vulture, inhabiting the great mountain chain of the Andes. There it may be seen soaring

high in air, its keen eyes intently scanning the ground beneath it; and it may fly to and fro for hours, rising and falling and sweeping round in great circles, and yet never once flap its wings!

Condors live for the most part on llamas which have died a natural death, or which have been killed by pumas and only partly devoured; but two or three of them will unite together, when they are hungry, in order to kill sheep or cattle.

In color the condor is grayish black, with a ruff of white feathers round the lower part of the neck. On the head of the male is a large fleshy wattle. It makes no nest at all, but simply lays its two white eggs on a rocky ledge high up on the mountain-side.

A variety of the condor inhabited Mexico and southern California until recent years, but has now become almost or quite extinct. It differed little from that of the Andes in either appearance or habits.

THE SECRETARY-VULTURE

The African secretary-vulture was formerly regarded as a kind of crane, on account of its long stilt-like legs, and owes its name to the curious tuft of very long feathers at the back of its head, which cause it to look rather as though it were carrying a number of quill pens behind its ears. The two middle feathers of the tail, also, are exceedingly long, so that when the bird is standing upright their tips almost rest upon the ground.

The secretary-bird spends its time on the ground, where it wanders over the plains in pairs, and feeds upon small mammals, lizards, tortoises, frogs, and locusts. It is also said to kill and devour even large snakes, but whether it really does so is not quite certain.

EAGLES--SYMBOLS OF POWER

Next to the vultures come the eagles, of which two examples may be mentioned—the white-headed, or bald eagle and the golden eagle, or war-eagle as the Indians called it. Both are known in various local varieties in all parts of the world, and

both have been regarded with admiration by brave men in all ages. The bald eagle is the symbol of the United States; and its cousin, the white-tailed, is to be seen along all the coasts of the Old World except the arctic. The American eagle frequents the shores of both oceans, and of our great lakes and rivers, because its favorite food is fish, which it obtains mainly by robbing the industrious fish-hawks.

Of a nobler character, according to our human ideas, is the golden eagle, and it is also larger, the female—which, in birds of prey, usually exceeds her mate in size—sometimes measuring nearly three feet in length and eight or nine feet across her outspread wings. This magnificent bird may still frequently be seen in the remoter and more mountainous parts of both continents, but in America is extremely rare east of the Rocky Mountains and Lake Superior, and in Europe west of the Swiss and German Alps. This was the eagle which by its bold mien so impressed the early conquerors of Italy that they chose it to represent them on their coins and standards, so that it came to be known throughout a subject world as the Roman Eagle; and its image has descended to the arms of Italy, Austria, Germany, Russia, and other nations.

The aerie, or nesting-place, of these grand birds is much the same in both kinds—a rude heap of sticks sufficiently hollowed on the summit to hold the brown-blotched eggs, and placed upon a ledge of rocks, or perhaps in the top of some huge tree. It may serve the purpose of a home for many years in succession. Eagles have been recorded on both sides of the Atlantic as using the same aerie for nearly a century without interruption; and in such cases the structure often becomes of prodigious size. A nest found in Scotland was nine feet high, five feet across at the top, and twenty feet in width at the bottom; so that it was really as big as a good-sized haystack!

Round this nest were the bones of between forty and fifty grouse, besides those of a number of lambs, rabbits, and hares, which had been brought there by the parent birds for the use of the young.

Very often a ledge close to the aerie is used as a larder, where the old birds put their victims as soon as they are caught, and

leave them until they are wanted. When they are hunting the two birds generally work together, one dashing in among bushes and low herbage, among which hares, partridges, or other animals are likely to be hiding, and the other lying in wait to pounce upon them as they rush out in alarm.

THE OSPREY AND OTHER HAWKS

Not quite as big as the eagles, the fish-hawk, or osprey, is nevertheless a large bird, for it measures nearly two feet in length and between five and six feet in spread of wing. It is found in nearly all parts of the world where civilization is not too destructive of its privileges, and is numerous on all our great lakes and rivers as well as by the coast.

The osprey feeds almost entirely upon fish, and may be seen sweeping to and fro over the water, keenly watching for its victims as they rise to the surface. When it catches sight of a fish it swoops down upon it, plunges into the water with a great splashing, and nearly always rises again a moment or two later with the fish struggling in its talons. But it does not always succeed in reaching the shore with it, for the white-headed eagle is also very fond of fish, though it does not like the trouble of catching them. So it lies in wait for the fish-hawk as it returns from a fishing expedition, and beats it about the head with its great wings until it is glad to drop its victim in order to escape, when the eagle swoops down and catches the morsel before it reaches the ground.

These great birds may still be seen all along our coasts and beside our lakes, where they live usually unmolested, although most other hawks are likely to be shot at by every wandering man and boy with a gun. This safety is due not only to the belief that they do no particular harm, but to a feeling, especially along the eastern sea-coast, that it is a lucky thing to have a pair build their nest near the home of a fisherman, to whom they are thought to bring good fortune. This nest is a big structure of sticks which is placed among the branches of a tree near the water—preferably a tall tree, but sometimes, when these are not handy, in a low one. Thus at the eastern end of Long Island,

New York, where the ospreys have been protected for many years, their nests often rest on a small cedar or other tree close to the ground; and in some places on the coast of New England men have erected little platforms on the top of poles where the ospreys have made their homes. All these nests are repaired and occupied year after year, and thus sometimes grow to be of immense size.

FAMILIAR FALCONS AND HAWKS

If one were to try to describe even half of the great number of different kinds of falcons and hawks in the world, or even in America, this book would not be large enough for the purpose. Among those most often seen in this country are two large, softly plumaged, brown hawks, with square, barred tails, of the group called buzzards. One is the red-tailed, another the red-shouldered, and a third the broad-winged, the several names denoting the specially noticeable features in each case. All make their homes in the woods, constructing big nests in trees, and early in the spring laying brown-blotched eggs. These hawks fly heavily over the fields in search of frogs, small snakes, field-mice (of which they catch great numbers), and once in a while seize a young bird which cannot yet fly very well; but mostly they live on mice and insects. The country people call all of them hen-hawks, and are likely to shoot them when they can; but in truth they harm the poultry-yard very little.

The really dangerous "hen-hawks" are two or three much smaller and more active falcons, such as the Cooper's and sharp-shinned hawks. They are swift and fierce, and will dart down and snatch a bird from its perch or pick up a small chicken with amazing suddenness and speed. These hawks are sometimes called kestrels, after a well-known European falcon which they resemble.

KESTRELS AND OTHER CHICKEN-HAWKS

You may often see one or the other of these hovering high in the air, as do the English kestrels, about three or four hundred

feet from the ground, and carefully watching for the mice upon which after all they mainly feed. It has eyes like telescopes, so that as soon as a mouse pokes its head out of its burrow it catches sight of it, swoops down upon it, seizes it in its talons, and carries it off to be devoured. The number of mice which it catches in this way is very large, and it has been estimated that at least ten thousand of these destructive little creatures are killed by every kestrel in the course of every year. So we must look upon the bird as one of the best friends of the farmer, in spite of the occasional loss of a chicken.

When it cannot find any mice the kestrel will sometimes eat small birds, and now and then it will feed upon cockchafers and other large insects, catching them in its claws as they fly, and then passing them up to its beak.

Kestrels sometimes build in trees and sometimes in towers and old buildings. But very often they make use of the deserted nest of a magpie or a crow. From four to six eggs are laid, which are blotched with reddish brown on a bluish-white ground.

Two near relatives, inhabiting both the old and the new worlds, are the pigeon-hawk and sparrow-hawk. They are much alike, and their plumage is more varied in color and pattern than that of other falcons. Both are rather shy, and not often seen in the open; but are so courageous that they will sometimes attack large birds, like ducks or grouse. The handsome sparrow-hawk is best known. It will often dash into a flock of sparrows and carry one of them off in its talons. It will sometimes swoop down into a farmyard, too, and snatch up a chicken or a duckling, while numbers of young pheasants and partridges fall victims to its ravages. In days of old it was sometimes captured and trained for hawking, like the merlin and the falcon, and it is said that a single tame sparrow-hawk would sometimes kill as many as seventy or eighty quail in a single day.

In Europe sparrow-hawks seldom take the trouble to build a nest of their own, but nearly always make use of the deserted abode of a crow or magpie, in which they lay three or four grayish-white eggs marked with a number of dark-brown

spots and blotches; but the American hawks of this group make their homes in crannies in hollow trees, stuffing the hole with a warm bed of grass and feathers.

OWLS, THE TERROR OF THE NIGHT

Next in order come those very singular birds which we call owls, and which are really hawks that fly by night.

The eyes of these birds are very much like those of cats, being formed in such a way as to take in even the faintest rays of light. Owing to this fact owls can see on very dark nights, and can fly with as much certainty and catch their prey with as much ease as other birds can in the daylight. Moreover the prominence of their eyes, in the middle of the great feathery disks, enables them to see in almost every direction without turning the head.

This is very important, for wild animals are always alarmed by motion, while they hardly ever notice creatures which keep perfectly still. If you sit or stand for a while without moving even a finger, rabbits and squirrels will often come quite close to you, and never seem to see you at all. But at your very first movement they will take fright and scamper away. So if an owl had to be constantly turning its head from side to side in order to look for prey, its victims would certainly see it, and would make good their escape. But as its eyes are set in the middle of those great feathery circles, and turn easily in their sockets, there is no need for it to do so, for it can look out in almost every direction without moving its head in the least.

There are a good many different kinds of owls, several of which are found in both continents. There is the long-eared owl, for instance, which has two rather long feathery tufts upon its head; and there is the short-eared owl, which has short ones. As a rule, these tufts lie flat upon the head. But when the bird is excited they stand upright, and give it a very odd appearance. Then there is the brown owl, which utters that mournful hooting sound which one so often hears by night in wooded districts.

Very often as one is walking along a country lane in the evening one of these birds sweeps suddenly by and disappears

into the darkness. It is busy searching for mice, and the number which it catches must be very great. For it has been found that when a pair of these birds have little ones, they bring a mouse to them about once in every quarter of an hour all through the night! And, besides that, their own appetites have to be satisfied; and owls seem always to be hungry.

One day the late Lord Lilford, one of the foremost British ornithologists of his time, tried to see how many mice a barn-owl really could swallow. So he caught one of these birds and put it in a cage, and gave it seven mice one after the other. Six of these it gulped down without any hesitation; but though it tried hard to swallow the seventh it could not quite manage to do so, and for about twenty minutes the tail of the mouse was dangling from a corner of its beak. At last, however, the tail disappeared; and three hours later the owl was actually hungry again, and ate four more mice!

None of the owls ever digest the bones and feathers or hair of their prey; but these materials get packed into balls in the stomach, and after a time are coughed up and thrown away. Very often large quantities of these "pellets" are found in hollow trees in which owls have been roosting, more than a bushel having been taken from a single tree, and by examining them one may learn the character of the bird's daily fare. The birds do not make a nest, but lay their eggs on a heap of these pellets instead; and they have an odd way of laying them at intervals, so that sometimes half-fledged little ones, newly hatched little ones, and freshly laid eggs may all be found together.

When the young owls are waiting for their parents to return with a mouse, they always get very much excited and make most odd noises, something like loud hisses followed by loud snores. And when at last one of the old birds returns with a mouse in its talons the outcry grows louder than ever.

One of the oddest members of the family is the burrowing owl, or coquimbo, as the South American form is known. This inhabits only the open plains of Western North America and Southern South America, and as it can find no trees or rocky niches in which to nest, it scratches out shallow burrows

in little banks of earth, or takes possession of the deserted burrows of some digging animal. It is therefore a constant citizen of the "towns" of the prairie-dogs of the North and viscachas of the South, where numbers of burrowing owls may sometimes be seen, some hunting about for beetles and grasshoppers, on which they chiefly feed, and others sitting at the entrances of the burrows and surveying the surrounding country. They are not at all timid, and if a man approaches them they will remain where they are until he is quite close, bobbing up and down from time to time as though they were politely bowing to him. If he continues to walk toward them they will rise into the air, fly two or three times round his head, screaming loudly as they do so, and then settle down on another mound a few yards away and bow to him again. But if he walks round them instead they will turn their heads to look after him, without moving their bodies, until one would almost think that they would twist them off altogether.

When neither prairie-dogs nor viscachas live in the neighborhood, these queer little owls will sometimes take up their quarters in the burrow of a wolf, a fox, or a badger. They make a very rough nest of grass and feathers, in which they lay from six to eleven white eggs.

CHAPTER XXI

CUCKOOS, NIGHTJARS, HUMMING-BIRDS, WOODPECKERS, AND TOUCANS

IN Europe the cuckoo is one of the most familiar and well-known birds, and every one recognizes its note, and regards it as a sure sign that summer is near. The bird usually reaches England about the second week in April, and very soon after that time the cock bird may be heard uttering his cry, which is one of the most familiar sounds of the country, until two months later. Then the bird's voice breaks, and after crying "cuck-cuck-cuck-oo" for a few days, instead of the simple "cuckoo," he becomes quite dumb, and is quite unable to utter his note again until the following spring.

This cuckoo is famous for its singular habit of placing its egg in the nest of some other bird, instead of making a nest of its own. The hen bird seems, first of all, to lay her egg on the ground; then, picking it up in her beak, she flies off to look for a suitable nest in which to put it. Having found one, she waits her opportunity, when the occupant is absent, and then slips in the egg and flies away. The owner of the nest, strange to say, hardly ever seems to notice when she comes back that there is a strange egg among her own, although very often it is not in the least like them in color and markings. So before very long a young cuckoo is hatched out, together with her own little ones. Then on the very day of its birth the cuckoo seems to make up its mind that before long there will be no room in the nest for any one but itself, and actually pushes all its little foster brothers and sisters over the side, one after the other! And, strange to say, the mother bird does not seem to mind, but just gives all the food which her own young would have eaten to the cuckoo, and takes the greatest care of it in every way until it is able to fly.

The cuckoo family is a large and varied one, with representatives in all parts of the world, and few of them show this extraordinary disposition to impose upon their neighbors, though all are careless home-makers. In the United States we have two kinds of cuckoos, the black-billed and the yellow-billed, which have much the same slim form and plain yet elegant dress as their European cousin, but a different note, uttering a loud rattling cry instead of the soft *cuck-oo*; and both of these make nests, lay eggs in them, and rear their young as faithfully as other birds. The nests, however, are merely loose platforms of twigs set among the branches of some small tree, through which, often, the greenish-blue eggs are distinctly visible.

NIGHTJARS

The nightjars are another world-wide family, with great similarity in both appearance and habit among its members. All are nocturnal, have big heads, large eyes, and very small beaks, although the mouth opens very wide. They hunt their food by night, resting during the day in shady forests or caves; and like owls they have plumage so plainly brown and gray, and so soft, that their flight is noiseless and almost invisible. The name—which refers to its jarring cry, which is more or less characteristic of the whole family—was given first to the British species, which is often called fern-owl in England. Late in the evening you may often hear it uttering its curious note—“chur-r-r-r-r-r”—which sometimes goes on without any break for three or four minutes.

This continuous calling is one of the most characteristic things about our American nightjar, the whippoorwill, whose loud, musical cry is heard in summer from almost every hillside in the land, during the dusk of evening or morning or when the woods are whitened with moonlight; and sometimes two or three birds will sing against one another, as if in jealous rivalry, repeating the call several hundred times without a pause. In the Western United States, and in tropical America, are several kinds of whippoorwill; and in the Southern States a bigger cousin which calls its name loudly through the darkness—*chuck-will's-*

widow. More nearly deserving the name nightjar, however, is our night-hawk, or bullbat, which is often seen flying swiftly about, high in the air, even before sunset, uttering a hoarse scream, or a queer-booming note, as it rushes, open-mouth, after unlucky insects.

All the birds of this group are insect catchers and eaters, and their mouths, which have only a tiny pretence of a beak, open exceedingly wide, so that they may scoop in a dozen little flies at once, or seize and swallow a great moth. Then the tongue is exceedingly sticky, like that of an ant-eater; besides this, the sides of the beak are fringed with long, stiff bristles. So, when the bird catches an insect, its victim nearly always sticks firmly to its tongue, while, if it should break away from that, the bristles act just like a cage, and prevent it from escaping.

The nightjars make no nest at all, but lay their eggs in a small hollow in the ground, generally under the shelter of a fern, or a tuft of bramble or heather. These eggs are never more than two in number, and are grayish white in color, mottled and marbled with gray and buff.

SWIFTS

In these arrangements and habits the nightjars show how nearly they are related to the very differently appearing chimney-swifts, which look so much like swallows that we often call them chimney-swallows, but this is wrong. Before this country was inhabited by white men, the swifts dwelt in companies in hollow trees, but as fast as the settlers built houses and chimneys the swifts left the trees and made their homes in the chimneys, where they fasten to the bricks little shelf-shaped nests composed of their glue-like saliva and bits of twigs. In the East Indies a kind of swift makes such a nest wholly out of its saliva, which hardens into a whitish material like isinglass. This is fastened against the wall or roof of some cave by the sea, and the Malays and Chinese gather these nests at the peril of their lives, where they are built in hundreds in dark caverns, and sell them as delicacies to be made into bird's-nest soup.

The swift feeds upon flies and small beetles, which it catches

in the air, and on any fine summer's day you may see it hawking for prey. It well deserves its name, for it dashes through the air with most wonderful speed, and is said to be able to fly at the rate of two hundred miles an hour! And as it flies it keeps twisting and turning after the fashion of a bat, and is evidently snapping up insect after insect as it goes.

Yet, strange to say, the bird never seems to be tired. It is often on the wing before three o'clock in the morning, and is still darting about as actively as ever after sunset.

HUMMING-BIRDS

Although they are not very much like swifts, the humming-birds are closely related to them, and have powers of flight which are really almost as wonderful. Indeed, if you alarm one of these birds when it is hovering over a flower, it will dart away with such astonishing speed that it is almost impossible for the eye to follow its course. And even while it is hovering the wings vibrate so rapidly that you cannot see them, all that is visible being a faint blur on either side of the body.

These exquisite little birds are found in Central and South America, in the West Indies, and in the warmer parts of the United States. Several very beautiful species are known west of the Rocky Mountains, but only one, the ruby-throat, visits the Eastern States. As a rule they are most beautifully colored, their plumage shining with metallic gold, and copper, and bronze, and purple, and crimson, and blue, and green.

Sometimes, too—for there are a great many different species—there is a ruff round the neck, or long tufts upon the head; or perhaps two of the tail-feathers may be produced until they are longer than the head and body and the rest of the tail put together.

As a rule, the beaks of humming-birds are very long, in order that they may be poked into flowers in search of any insects which may be lying hidden within them. And the bird will hover over a bush, and move on from one blossom to another, until every one has been thoroughly explored.

The nests of humming-birds are nearly always very small and



FOUR HANDSOME BIRDS.

1. American Pileated Woodpecker, or Logcock. 2. European Roller.
3. European Kingfisher. 4. European Jay.

cup-shaped, and are made of little bits of lichen and moss neatly fastened together with the silken threads of certain spiders. Only two eggs are laid, which are quite white, and so tiny that it seems impossible that a bird could be hatched out of them. At least five hundred kinds of these beautiful little birds have already been discovered.

WOODPECKERS

North America has a large population of woodpeckers, including the biggest and finest one in the world. This is the great ivory-bill—twenty inches in length, and jet-black, with white wing-tips, a grand scarlet topknot, and a beak like an ivory pickax. It used to be abundant all over the Southern States, but now is nearly extinct. Almost as fine, and still frequently seen all over the eastern parts of the United States and Canada, is the similar but smaller logcock, or pileated woodpecker, as it is named in the books, whose shrill scream may be heard half a mile.

Most of our familiar woodpeckers, however, are much smaller, and their plumage is a checker of black and white. Everywhere common in town, as well as among the farmlands, are three or four species, of which the most often seen, and the smallest, is the downy woodpecker, which gets its name from the broad stripe of soft white feathers up and down the middle of its back. It is not so large as a sparrow, and haunts the woods, the farmer's orchards, the shade-trees along the rural roads or beside the streets of our villages, and often makes itself a welcome visitor to the city parks and gardens. From morning till night, and all the year round, it scrambles up and down the trunks of the trees and round and round their branches, cleverly finding and dragging out insects or their young concealed under the scales of the bark; and though it digs many pits none is deep enough to injure the tree, as the only woodpecker which digs deep enough to do harm is the yellow-bellied one, which appears only in the spring, going far north to breed, and which country people call the sap-sucker. The downy and its relatives, on the other hand, are doing good every day. Especially welcome is this active little visitor in winter, often with such small companions as the chicka-

dee and nuthatch, when birds, or any other sort of living things are scarce, and we are longing for their return.

If you sit down for awhile at the foot of a tree, and keep very still indeed, without moving even so much as a finger, it will very likely come and sit on the trunk of another tree close by and begin to peck away with its long, sharp beak in search of insects.

How it makes the chips fly! Its beak is just like a chisel, and when the bird finds that a beetle or a grub has burrowed into the trunk, it does not take very long to dig it out. And it also has an extremely odd tongue, which is very long and slender, and very sticky, and has a curious tip. By means of this tongue the bird can often drag an insect out of its burrow without being obliged to dig right down to it.

Sometimes woodpeckers make a most amusing mistake. They hear the humming of a telegraph wire, and think that it must be caused by insects living in the posts. So they set to work with the utmost energy to dig them out, and are so diligent and so persevering that they have often been known to cut a big hole right through a telegraph post before finding out that there were no insects there after all!

There is another thing that we wish you especially to notice about the woodpecker, and that is the way in which it is enabled to sit on an upright tree-trunk for a long time without getting tired. The fact is that it really sits on its own tail, which serves as a kind of camp-stool! If you look at a woodpecker's tail you will find that the feathers are very short and very stiff, and that they are bent downward. When the bird perches on the trunk of a tree the tips of these feathers rest upon the bark and prop it up, so that there is very little strain upon the muscles of the feet and legs.

Downy, after the manner of its kind, uses its chisel-beak to form a deep and safe home in some old tree or stump, and often has enough confidence in its friends of the village or farm to choose a tall fence-post; and therein it deposits its pure white eggs and shelters its babies. Moreover, Papa Downy often digs near by a more shallow tunnel for himself, where he spends the night in safety and comfort as his mate is doing in her own snug chamber.

The hairy woodpecker is very similar to the downy in dress, but one-half larger, and by no means so numerous or familiar. There are several northern and far-western kinds of checkered woodpecker such as the three-toed, the arctic and others, but their habits are very similar, and we may pass them by to speak of two species more notable in every way.

THE REDHEAD AND THE FLICKER

The redhead is most strikingly colored, for its whole head and neck are scarlet, its shoulders and back black, its wing-quills and rump white, and the tail black. It is a fairly large bird and a bold one, though like all woodpeckers it will slip around to the other side of the tree when it hears your step, and then peep out with comical caution to see whether you are dangerous. If you keep quiet it is likely soon to scuttle back and go on hammering, making the chips fly and the forest ring with its busy search after some buried grub. The Indians made a good deal of use of the scarlet feathers of this bird; and it is always a tempting mark for the wandering gunner, so that it is no wonder it is becoming rare in thickly settled regions.

A much less handsome but more numerous woodpecker in all parts of the country is the golden-winged, or flicker, or high-hole, for it goes by many names among the boys who love to trace it to its nesting-hole in some tall stub, and take, if they can, the pearly eggs that lie on a bed of chips in the bottom of the cavity. This nesting-hole, with its accurately round doorway and hall, goes straight into the tree-trunk for two inches or so, and then turns downward sometimes to the depth of a foot. This large woodpecker is not black and white, like most of the others, but wears a dress of greenish brown with wing-quills that look just as though they were gilded, and a small bonnet of red on the back of its head where there is no crest. In fact, the flicker is a queer sort of woodpecker generally, for it spends quite as much time in fields and gardens as in the woods, and much of this on the ground in search of insects—mostly ants.

Woodpeckers are noisy birds, both in their hammering and

in their rough cries, and this one is perhaps the noisiest of all; but its call is so joyous that one cannot hear it without a sense of cheer.

TOUCANS

We now come to a group of really extraordinary birds. They are found in the forests of Central and South America, and are chiefly remarkable for their beaks, which in the first place are so enormous that they look as if they had been intended for birds at least six times as big, and in the second place are most gaudily colored. It is not very easy to describe them, because there are a good many kinds of toucans, and each has its bill differently colored. In one the beak is partly orange and partly black, with a lilac base. In another it is light green, with the tip and edges of the most brilliant scarlet. In a third it is half scarlet and half bright yellow; while in a fourth it is creamy white with a broad streak of crimson running along the middle; and in a fifth is a most singular mixture of orange and blue and chocolate brown and white.

Owing to the great size of their bills these birds are most ungainly in appearance, and one cannot help wondering how they manage to hold up their heads. But in reality these huge beaks are not at all heavy, for instead of being made of solid horn, the whole of the interior is broken up into cells, the divisions between which are no thicker than paper—a structure which gives them not only great lightness but great strength.

Toucans live chiefly in the trees, and spend most of their time in the topmost branches, where they are fond of gathering together in large flocks. They are very noisy birds, for they not only utter hoarse cries and loud yells in chorus, but have a way of clattering their beaks together as well. Owing to this habit the natives of South America sometimes call them “preacher-birds.”

When they go to sleep toucans double their tails over upon their backs, just as though they had hinges at the base, and bury their great beaks among the feathers of their shoulders. The consequence is that they do not look like toucans at

all, or even like birds, and seem to be mere bundles of loose feathers.

HORNBILLS

These are more extraordinary still, some of them having beaks so enormous that they look as if they had been meant for birds twelve times instead of only six times as big as themselves. And the strangest thing of all is that upon the upper part is a great horny helmet, which in some cases is quite as large as the beak itself. In the rhinoceros-hornbill, indeed, the beak and helmet together are pretty nearly as big as the body.

Both beak and helmet, however, except in one species, are made just like the bills of the toucans, so that in spite of their enormous size they are not at all heavy. But *why* they should be so big is more than we can tell you.

Hornbills are found in many parts of both Africa and Asia, and most of them live in the trees. They nearly always hop from one branch to another until they reach the very topmost boughs, where they will sit for hours together, occasionally uttering a series of loud, roaring cries, which can be heard for a very long distance. And when they fly they keep opening and closing their beaks, and so making an odd clattering noise which generally puzzles travelers very much when they hear it for the first time.

There are two kinds of hornbills which live on the ground. One of these is found in South Africa, and the Kafirs have a curious idea about it, due to the fact that after death its body smells very nasty. They think that if one of these birds is killed and thrown into a river it will make the stream feel ill, and that a heavy fall of rain will take place in order that the carcass may be washed into the sea! So in times of drought they always try to kill a ground-hornbill and fling it into the nearest river.

When one of these birds discovers a snake, its cries bring others to the place, and then, it is said, three or four attack the snake and kill it. Their plan is to advance upon it sideways with their wings spread out, and to irritate it with the tips of

the feathers until it strikes. Then they all peck it together before it can recover itself, and nearly always succeed in killing it in a very short time.

THE HOOPOE

This is another odd-looking bird; but instead of having a horny helmet like the hornbills, it has a crest of very long feathers. These feathers, which can be raised or lowered at will, are tawny brown in color, with black tips, just before which is a streak of white. The body is grayish brown above and nearly white below, and the wings and tail are black, barred with white.

The real home of the bird is in the sandy deserts of Northern Africa and Southern Asia. There its plumage harmonizes so well with the color of the soil that it is very difficult to see it, and it is said that when a hawk appears the hoopoe only has to flatten its body against the sand and remain perfectly still, when it is quite sure to be overlooked by its enemy.

The hoopoe utters its cry in a very curious manner. First it puffs out the sides of its neck, and then it hammers its beak three times upon the ground. Each time that it does so some of the air in its throat escapes, and the result is a noise like the syllable "hoo" three times repeated.

AN ARAB LEGEND

The Arabs have an odd legend about the hoopoe. One day, so the quaint old story runs, King Solomon was traveling through the desert, and was much oppressed by the heat of the sun, till a large flock of hoopoes came and flew just above his head, so as to protect him from its rays. At the close of the day the grateful monarch wished to know how he could reward them for their kindness, and the foolish birds asked that crowns of gold might grow upon their heads. Their request was granted, and for a few days they admired themselves immensely, and spent most of their time in gazing at their reflections in pools of water. Very soon, however, great numbers of them were snared by the fowlers for the sake of their valuable orna-

ments, and it seemed as though in a short time not one would be left alive. So at last the survivors went back to King Solomon, and begged that their golden crowns might be taken away. Once more the king listened to their petition, and gave them crowns of feathers instead, and that is how hoopoes come to have crests upon their heads.

KINGFISHERS

One of the most beautiful birds of our country is the kingfisher, which is deep blue with white markings, and a chestnut band across the breast. Upon its head is borne a high crest, like a crown. As you walk along the banks of a stream, you may often see them darting through the air, and looking almost like streaks of colored light. And if you sit down and keep perfectly still for a little while you may, perhaps, see one of them fishing. It perches on a branch overhanging the water, and waits patiently till a fish passes underneath. Then suddenly it drops into the water like a stone, splashes about for a moment or two, and then returns to its perch with its victim struggling in its beak.

The kingfisher digs a deep hole into the face of some earthen bank or cliff, and at the inner end hollows out a little cave where it lays several pure white eggs, with almost nothing but a few fishbones for a nest.

A good many different kinds of kingfishers are found in various parts of the world, one of them, which lives in Australia, being known as the laughing jackass, on account of its singular cry. Everywhere there are birds of brilliant plumage, and in some places they have been almost wholly destroyed for the wicked purpose of getting feathers to use as ornaments on ladies' hats.

CHAPTER XXII

CROWS, BIRDS OF PARADISE, AND FINCHES

THE crow tribe contains several most interesting birds, first among which stands the raven, a bird once known in all the northern parts of the world, but now exceedingly rare in the United States except in the far West. Even in the mountainous districts of Scotland it is not nearly so common as it was, for it is so fond of killing weak and sickly lambs that the shepherds trap or shoot it whenever they have an opportunity, and the gamekeepers dislike it quite as much, because of the numbers of hares, rabbits, partridges, and grouse that fall victims to its terrible beak.

Ravens have often been tamed, and have even learned to talk almost as well as parrots. But they are exceedingly mischievous birds, and, in addition, are only too ready to peck any one who comes near them with the full force of their sharp and powerful bills; so that they cannot be at all recommended as pets.

The nest of the raven is a rather clumsy structure of sticks, and is nearly always placed in the upper branches of a very tall tree. When the young birds are nearly fledged, they often tumble out of the nest, and are found by the shepherds fluttering helplessly about on the ground. Most of the ravens which are kept in captivity have been caught in this way.

THE AMERICAN CROW

The various crows of the world are like small ravens—jet-black, sometimes marked with white; but our familiar American crow is wholly black. These birds are fond of gathering into flocks, which sometimes are very large; and they are sociable, liking to spend the night roosting in some favorite grove in great companies. When near the sea, or some large river or lake, the crows go down to the shore every morning, and spend most of

the day on or near the beach, where they pick up most of their food. Crows, however, will eat almost anything edible except grain; and the great European carrion-crow is almost a bird of prey, for like the raven it feeds chiefly on the flesh of dead animals. But it also preys upon such creatures as rabbits, hares, mice, frogs, and lizards, while it will also search for the nests of game birds and poultry, and carry off the eggs and the young. Sometimes, too, it will visit the sea-shore, and feast upon the crabs, limpets, and mussels which it finds among the rocks at low water. In order to crack the shells of these creatures, it is said sometimes to carry them up into the air and drop them upon a rock.

ROOKS

Except that it places its rude, stick-built nest in scattered trees, each pair by itself, instead of in a company, our American crow is closely similar to the English rooks about which so much is said in books about Great Britain. Everybody in England knows the rook by sight, and everybody is familiar with the rookeries in which a number of these birds nest together year after year. Indeed, they use the same nests over and over again, just putting them into proper order shortly before the eggs are laid.

The scene when building operations begin is always a lively one, and all day long the birds are very busy. But oddly enough, they never seem to know when the winter is really over, and when a thaw comes after two or three frosty days in December, or even earlier, they get as excited as possible, setting to work and gathering sticks, and evidently thinking that spring is beginning!

Rooks have very strict rules when they are building. For one rook to steal a stick from another rook's nest, for example, is a very serious crime, and sometimes is punished even with death. And young birds are not allowed to build in a tree outside the rookery, their nest being at once pulled to pieces by the older ones if they attempt to do so.

Crows of all kinds are extremely useful birds, for they devour enormous quantities of mischievous grubs, more especially those which live at the roots of cultivated plants, where other birds

cannot get at them. And you may often see them following the plow, and picking up their victims in scores. Thus they more than pay the farmer for the stalks of young corn or grain which they sometimes pull up in the spring.

THE JACKDAW

Another famous European bird, taking a part in many familiar stories and poems, is the jackdaw. It is a smaller bird than the rook, and is generally found near houses, being very fond of nesting in church towers, or in old ruins. But very often a colony of jackdaws will settle in a lofty cliff, and build on rocky ledges far beyond the reach of even the boldest climber.

The jackdaw is easily tamed, and is a very interesting bird when kept as a pet, soon learning to talk almost as well as a parrot. But it is dreadfully mischievous, and if it finds any small glittering object is almost sure to carry it off and hide it. Sometimes, too, it will play very amusing tricks. We knew a tame jackdaw once which lived in a very large garden. One day the butcher's cart drove up, and the butcher went round to the kitchen entrance to take the orders. No sooner had he disappeared than the jackdaw flew up on the box, and called out, "Gee up!" Off started the horse at once, and if the gardener had not happened to meet the cart as it was passing out of the gate, with only the jackdaw inside, the butcher would certainly have been obliged to walk all the way home.

The nest of the jackdaw, like that of the rook, is built of sticks, and is lined with hay, wool, and feathers. It generally contains five eggs, which are bluish green, spotted with gray and brown.

THE JAY

What a beautiful bird the jay is! And how very seldom one gets a really good view of it! For it is one of the shyest of all birds, and never allows itself to be seen if it can possibly help it. And the very moment that it catches sight of one it flies off with a terrified squall which can often be heard from nearly half a mile away.

Other birds do not at all like the jay, for it is very fond of visiting their nests and stealing the eggs. It will carry off young birds, too, and devour them, and many a young partridge and pheasant falls victim to its appetite. But it also eats caterpillars, moths, beetles, and other insects, as well as fruit and berries; while sometimes it will visit a kitchen garden early in the morning, and feast heartily on the young peas.

Our common Eastern American jay is light blue, with pretty white markings; while in the far West and in the tropics are many kinds which are rich dark blue or green; the European jay, however, is more varied. In general color it is light reddish brown. On either wing is a patch of azure blue banded with black, while the head is decorated with a crest of gray feathers, with black spots, which can be raised and lowered at will. Nearly all jays have tall crests. The quill-feathers of the wings and tail are black.

THE MAGPIE

Another famous member of this family is the magpie, which occurs in both Europe and America, and may be recognized by its glossy black and white plumage, its long tail, and its curious dipping flight. It is found in most parts of the British Isles, but never wanders far away from the shelter of large woods, where it knows that it is much safer from the attacks of hawks than in the open country.

The magpie is as mischievous out of doors as the jay, and as mischievous indoors as the jackdaw; so that it cannot be said to bear a very good character. But at any rate it makes a very amusing little pet, even if it does steal any small object that it can carry away, and hide it in some hoard of its own. But with a little careful instruction it soon learns to talk quite well. In Europe, consequently, many tame magpies are to be seen; but not so often in the United States.

The nest of the magpie cannot be mistaken for that of any other bird, for although it is made of sticks, like that of the jackdaw and the jay, it is always domed above, and has the entrance at the side. It is generally situated in a thorn or a

pine tree, although now and then the birds will build in a low bush quite close to the ground. There are generally from five to seven eggs, which are bluish white in color, blotched and dotted with brown.

BIRDS OF PARADISE

Next in order to the crows, jays, and magpies come these. They include some of the most beautiful of all the feathered race. They are nearly all found in New Guinea and the Papuan islands, and there are altogether about fifty different kinds.

One of the most beautiful is the king bird of paradise, which it is very difficult to describe in words. The upper part of the body is rich chestnut, with a bloom of purple, the lower part pure white, and across the breast runs a band of golden green, which deepens into blackish brown, while the upper part of the head and neck is pale straw-color. Most exquisite of all, however, are the great masses of long, slender, drooping plumes, which spring from either side of the body under the wings. These plumes are nearly two feet long, and are golden yellow, darkening toward the tips into pale brown. This exquisite plumage is only found in the cock bird, the hen being of a dull brown color all over, without any plumes at all; and the birds have now become extremely scarce because killed so incessantly for the cruel purpose of getting their feathers to put on hats!

Very little is known about the habits of birds of paradise, for few people ever have the opportunity of seeing them in their native forests, and they are almost unknown in zoölogical gardens because they usually die almost immediately when placed in captivity in a strange country.

BOWER-BIRDS

The bower-birds of Australia owe their name to their singular habit of making bowers in which to play! These bowers are built of sticks and long pieces of grass, arranged in such a way

that they meet at the top so as to form a kind of avenue, and are often three feet long. Stranger still, they are ornamented with stones, brightly colored shells, and the blue tail-feathers of parakeets, which the birds carefully fasten up among the sticks, evidently in order to make the bower look pretty. Then, when it is finished, they run through it, round and round, over and over again, chasing one another, and seeming to enjoy their game immensely.

There is one of these birds, found in Papua, which builds a hut about two feet high instead of a bower, and then makes a sort of garden in front of it. This garden is decorated with bright-colored flowers and berries, and as soon as they fade the bird throws them away and puts fresh ones in their place! It is called the gardener-bird.

THE STARLING

This bird is almost as well known as the sparrow in Europe. You may see it on the lawn, every now and then plunging its beak into the ground, and pulling out a grub or a worm; and it is fond of building a great untidy-looking nest in water-pipes and other places where it is not wanted. It is beginning to be well known also in America, for, from colonies established near New York City, it has spread through several States.

Starlings in Europe often travel about the country in great flocks, which frequently consist of several thousand birds. Sometimes, too, several of these flocks join together at night, and then separate again next morning. We have seen a little copse so full of roosting starlings that every branch of every tree was occupied from end to end, while thousands more kept flying in, and trying to turn the first comers off their perches! And they made so much noise that we could hear them chattering and quarreling when we were more than a mile away.

Each flight of starlings seems to have its leader whose orders are instantly obeyed, for every bird in the whole flock swerves, and wheels, and turns at the same moment—a maneuver seen equally in the vast migratory flocks of red-winged blackbirds which gather in autumn on every American marsh and are

gradually spreading inland. A few years hence the bird may be seen all over the United States.

Starlings are useful birds, although they certainly steal a great deal of fruit; for if it were not for their labors—together with those of certain other birds—our corn and vegetable crops would certainly be destroyed by the mischievous grubs which live at the roots. So we ought to look on the fruit which starlings take as wages paid them for their work.

FINCHES

We now come to the great group of the finches, which can easily be recognized by their short, stout, strong beaks.

This is one of the most extensive families of birds, for it includes, besides the finches properly so called, all the sparrows, grosbeaks, buntings, and seed-eaters of the world, together with many other similar birds known by various names. The small robust size, and especially the cone-shaped beak, suitable for cracking seeds, or tearing the husks of fruit to pieces, are the badges of the family. Sometimes this beak is big and strong, as in our northern rose-breasted, or the southern cardinal grosbeak, or the British bullfinch; sometimes small and slender, as in the sparrows, such as our pretty visitor to the garden lilacs and rose-bushes, the chipping-bird; sometimes queerly out of shape, as in the crossbills, where the lower half, or mandible, of the bill does not meet the upper one squarely at the tip, but the points cross past one another. These birds dwell in the northern evergreen forests, and subsist almost wholly on the seeds of the pine and spruce, which they twist out from beneath the tough scales of the cones with remarkable skill, apparently using the crossed bill like a pair of pliers.

These birds come south in winter, when their bright reddish coats and fearless ways are enjoyed by everybody. The farm children in Germany hear pretty stories about them, one of which is that the twist in the bill was caused by one of these birds injuring it in kindly trying to pull out the nails by which Jesus was fastened to the cross; so their name "cross-bill" may be thought of in two ways.



FINCHES AND WEAVER-BIRDS.

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| 1. European Yellowhammer. | 3. African Weaver-Bird (Female). |
| 2. African Weaver-Bird (Male). | 4. European Goldfinch. |
| 5. Stonechat. | |

SPARROWS

Every roadside and field has its sparrows—brown, streaked birds which usually keep near the ground and feed upon the seeds of grasses and weeds, yet pick up innumerable insects, as do all the others of their busy tribe. These sparrows make their nests mostly on the ground; but most of the finches, rightly so called, nest in bushes and trees. All the sparrows have pleasant voices, and most of them are fair singers, while some excel in that accomplishment. Our song-sparrow, fox-sparrow, the whitethroat and others are among the best of American singing birds.

It has been said that these plain brown birds have been granted the gift of voice to make up for lack of ornament; but this explanation doesn't seem to amount to much, for if it were true we ought to find the richly dressed birds songless. That this is not the case in this family, at least, is plain when we remember that our finches—and it is equally true of foreign ones—include some of the most brilliantly colored birds we have, such as the goldfinch, the purple finch, the indigo-bird, the exquisite blue and red nonpareil of Louisiana, and many others, all of which are capital musicians.

Some of these finches are among our most highly prized cage-birds, such as the European bullfinch, which not only sings prettily when wild, but if caught young can be trained to learn several tunes, and between whistles pipes and chirrups gaily. The goldfinch, linnet, waxbill, and several others belong to this interesting tribe.

CANARIES

Canaries, too, are finches, and are plentiful in the islands from which they take their name. But if you were to see them in their own home you would hardly recognize them; for a wild canary that is yellow all over is hardly ever seen. Our cage-canaries, in fact, are an artificial breed, the natural color of the plumage being olive green, marked with black and yellow.

Neither would you recognize the song of the wild birds, which is not nearly so powerful nor so varied as that of the feathered pets which we all know so well.

Now and then talking canaries have been known, which had learned to utter a number of different words quite distinctly.

THE SKYLARK

No bird is more celebrated than the skylark, which has inspired countless poems. It is a plain brown little bird, like one of our field-sparrows; and would attract little attention were it not for the sweetly clear and varied music of its joyous song as it mounts higher and higher in the air, till at last it looks a mere speck in the sky. For nearly eight months in the year it sings, and one can scarcely take a ramble in the country without seeing and hearing it. A small colony of skylarks dwelt for a time on Long Island, in the edge of Brooklyn, N. Y., where the song was heard by many a person; but for several years no member of this colony has been seen or heard, and not a skylark is now living in freedom in America.

The skylark builds upon the ground, in some little hollow, and its nest is so well hidden that one scarcely ever finds it. It is made of dry grass, leaves, and hair, and contains four or five yellowish-gray eggs speckled with brown.

CHAPTER XXIII

WAGTAILS, SHRIKES, THRUSHES, Etc.

ONE can scarcely walk along the banks of a British stream in spring or summer without noticing a pretty and graceful bird, sometimes running along near the edge of the water, and stopping every now and then to pick off an insect from the herbage, and sometimes rising into the air to catch a fly or gnat. And one can easily understand why the name wagtail has been given to it, for no matter whether it is flying or running, its tail is never still. Sometimes, too, it may be seen in a damp meadow, or even on a lawn in a garden; and where one wagtail is, others are sure to be not very far off.

The nest of this bird is usually placed in a hole in a river-bank, or else among the spreading roots of a tree. It is made of dry grass, withered leaves, and moss, and is lined with hair, wool, or feathers.

This description applies excellently to a little American bird, known as the water-thrush, although it is not a true thrush, but one of the warblers, of which a great many sorts, some very beautiful, are seen in our woods in the spring, on their way north; but just a few appear to remain with us all the year round.

THE CREEPER

Running about on the trunks and branches of trees, and looking very much like a feathered mouse, you may often see the creeper. It is about as big as a wren, and has a long, slender, and slightly curved beak, which it is constantly poking into the cracks and crevices of the bark in search of insects. It always begins its quest low down on the trunk, and works its way gradually upward, peering into every little cranny, and

seldom remaining still for a single moment. The larger boughs are examined in just the same way, and when the bird has reached the top of the tree it flies down to another and begins again, and so on all through the day. And in order to prevent it from getting tired, it has a short, stiff tail like that of the woodpecker, which serves as a kind of camp-stool, and supports the weight of the body.

The nest of this quaint little bird is nearly always placed in a hole in a tree-trunk. It is made of roots, twigs, fragments of bark, and grass, and is lined with wool and feathers. From six to nine eggs are laid, which are white in color, prettily spotted with yellowish red.

THE NUTHATCH

This is another bird that one may often see running about on the trunk of a tree. It is shaped rather like a wren, but is a little bigger than a sparrow, and has a bluish-gray head and back, a white throat and breast. It has the curious habit of keeping head downward almost continuously as it works.

The European nuthatch is very fond of nuts, which it cracks in a most curious way. First of all, it wedges a nut firmly in some crevice in the bark of a tree. Then, taking up its stand on the trunk just above, it deals blow after blow on the nut with its stout little beak, swinging itself up into the air every time that it does so and giving a flap with its wings, so as to add force to its stroke. It turns itself into a kind of live pickax, and after a very few blows the nutshell is split open, and the clever little bird is able to get at the kernel; but our American nuthatch seems to have forgotten this habit, if it ever had it, and lives almost wholly on insects.

The nuthatch makes its nest in a hole in a tree, and it is generally composed of small pieces of soft bark, lined with dry leaves. When the mother bird is sitting on her eggs, which are white in color, spotted with pink, she will peck most savagely at any enemy which may try to enter, hissing as she does so, just like a snake.



AMERICAN INSECT-EATING SONG-BIRDS

1. Chimney Swift. 2. Barn Swallow. 3. Wood Thrush. 4. Red-eyed Vireo. 5. Chestnut-sided Warbler. 6. Maryland Yellow-throat. 7. Redstart. 8. Phoebe Pewee. 9. Black-throated Green Warbler. 10. King-bird. 11. Cedar Waxwing. 12. Oven-bird. 13. Bluebird. All adult males.



TITMICE

These birds can be seen almost everywhere, and very pretty and attractive little birds they are as they run about on the trunks and branches of trees, not seeming to mind in the least whether they are perching on a bough, or hanging upside down underneath it. And all the while they are searching every little chink and cranny in order to see whether any small insects are hiding within it.

It is a very good plan in winter to take a marrow-bone, or a little network bag with a lump of suet in it, and hang it from the branch of a tree for the titmice. Day after day the little birds will visit it, clinging to it in all sorts of positions, and pecking vigorously away at the suspended dainty. And they will like a cocoanut which has been cut in half almost as well.

Several other kinds of titmice are also found in the British Isles, of which the great tit, the cole-tit, and the blue tit are plentiful almost everywhere. They are all very much alike in habits, and they all build in holes in trees, making their nests of moss, hair, wool, and feathers, and laying six or eight white eggs, prettily speckled with light red.

Titmice abound in all northern countries and, we have several American species, one of which, the merry, courageous little black-capped chickadee, is known by both eye and ear to every one who takes any notice of birds. In the Southern States another familiar one is the peto, or crested chickadee, who, when he lifts his pointed gray cap, reminds one of a tiny jay. The Rocky Mountain region and Pacific coast have several other kinds—all delightful. Our titmice all make their nests in holes in trees and stumps, usually taking possession of the last year's home of a woodpecker.

In Europe there is a famous titmouse having a very different method. This is the long-tailed tit, or bottle-tit, as it is sometimes called, because its nest is shaped just like a bottle without a neck. It is sometimes placed in the fork of a branch, but more generally in the middle of a thick bush, and is made of wool,

moss, and spider-silk, and is lined with quantities of soft downy feathers. And although it is by no means small it is very easily overlooked, for the clever little birds cover all the outside with bits of gray lichen, so as to make it look as much like the surrounding branches as possible.

In this beautiful and cosy nest from ten to twelve eggs are laid, which are white in color, with just a few very small reddish spots. When the young birds are nearly fledged they quite fill up their nursery, and you can actually see the walls swelling out and contracting again as the little creatures breathe. And how they all manage to keep their long tails unruffled in those narrow quarters nobody knows at all.

In winter you may often see a whole family of these pretty birds—father, mother, and ten or a dozen little ones—all flying about together, for they never separate until the spring.

THE SHRIKE

A notable bird is the shrike, which is also known as the butcher-bird, owing to a most curious habit. It is a bird of prey, feeding upon all sorts of small creatures, and it seems to know that though it can catch plenty of these on warm, sunny days, they will all be hiding away in their retreats when the weather is cold and rainy. So on a fine, bright morning it will catch many more victims than it wants at the time, and put them away in its larder! Sometimes you may find a thorn-bush with four or five mice, half a dozen unfledged birds, two or three fat caterpillars, a big beetle or two, and perhaps a bumblebee, all stuck upon the thorns, like the joints of meat hung up in a butcher's shop. Then you may be quite sure that you have discovered a butcher-bird's larder. And by and by, when a cold and wet day comes, and the bird can catch no prey, it just comes and takes some of these creatures from the thorns, and so obtains plenty of provisions!

There are two species of shrike in the United States—one which visits us from the south in summer and the other from the north in winter.

THRUSHES

The thrush family is spread all over the world, and contains some of the most noted of singing birds. No one can read English poetry, or much of the classic prose of our language, without meeting with the names of such birds as the mavis, the blackbird, the blackcap, and especially the nightingale, all European thrushes; even the English robin, after which our larger American redbreast is named, is a sort of thrush, closely related to our dear little bluebird.

THE ROBIN

The robin is a great favorite with the people of Europe, because it is so very trustful. We have actually seen one of these birds perching on a man's knee for quite a minute, while it looked about for worms in a plot of ground which he had just been digging. But it is by no means so gentle a bird as many people think. In fact, it is a very quarrelsome bird, for if two cock robins meet they are almost sure to fight, and very often the battle goes on until one of the two is killed!

A robin once took up his abode in Hereford Cathedral, and seemed to think that it was his own private property. For one day, when another robin came in, he was seen chasing it all over the building, and was at last found sitting triumphantly on its dead body!

You may find the nest of the robin in a hole in a bank or a wall, or perhaps in the stump of a tree. It is made of dry leaves, roots, grass, and moss, lined with hair, or wool, and contains either five or six yellowish-white eggs, spotted with light brown.

THE NIGHTINGALE

Perhaps no bird in the world is so famous as a songster as the nightingale, largely because of its habit of singing in the night, for its music is not preëminent above that of several other thrushes. The nightingale spends the winter in Africa, return-

ing to Central Europe in April, and after that in the warmer parts of Great Britain and the continent it may be heard every night for weeks, especially when the moon shines; and sometimes nearly all day as well.

If one passes near a bush in which a nightingale is singing, it is worth while to stop and to whistle a few low notes. The bird imagines that it is being challenged by another nightingale, and begins to sing louder than before. Then it stops and listens; and if one whistles a few notes more it becomes very much excited, and comes closer and closer, singing all the time, till at last it finds out how it has been taken in. And then it begins to scold, chattering away in the greatest indignation at having been deceived!

Only the cock nightingale sings, and even he is only able to do so for a few weeks. For very soon after the eggs are hatched his voice breaks, just as that of the cuckoo does, and the only note which he is able to utter until spring comes round again is a harsh whistle, followed by a hoarse croak.

The nest of the nightingale is placed on the ground under a low bush, and is made almost entirely of dead leaves. It contains either four or five eggs, which are dark olive brown all over.

NORTH AMERICAN THRUSHES

There is a long list of thrushes among our North American birds, and some of them will compare well as songsters with any of the woodland choristers of the world. The voice of our red-breasted robin carols sweetly enough in the spring; but he is far excelled a little later in the season by the wood-thrush, the hermit-thrush, the veery and certain others which come from the south when the weather becomes warm. Some of these species, as the hermit and its relatives, pass on into Northern Canada to make their nests and rear their young; but fortunately others—and among them queens of song—remain with us in the United States all summer.

Of these the most commonly seen and heard is that richest of woodland musicians, the wood-thrush, whose serenely beautiful song, in four parts, separated by brief pauses, floats

to our ears from orchard and grove and shady roadside as the quiet of the summer evening draws on, and we begin to enjoy the coolness and peace of the twilight.

This eloquent thrush is reddish brown or bright cinnamon above, brightest on the head; and white below, thickly ornamented with rounded black spots in lines from throat to thighs. It is the least shy of all the thrushes except the robin, yet gracefully modest in its demeanor. It constructs its nest on the low horizontal limb of some tree, always with the peculiarity that its foundation is a layer of old sear leaves and that black, thread-like rootlets are a favorite material for the walls. The eggs are unspotted blue, smaller and lighter than the greenish treasures in the mud-built cabin of the robin.

Next in point of numbers, though not so often recognized, as the wood-thrush is the oliveback, which is distinctly olive in color on the back and flanks, and whose buffy underparts are unspotted save across the breast. This species is highly variable, so that those of the Pacific coast differ considerably from those of the Atlantic side of the continent.

The same is true of the hermit-thrush, which is heard only in the more northern half of the continent in spring, when its rich, indescribable fluting perhaps deserves the prize of superiority over all other American bird-musicians.

The veery, or Wilson's tawny thrush, is also noted for its song, which has an extraordinary bell-like quality which excites first curiosity and then admiration.

The group of birds to which the thrushes belong is a very large one, and includes many smaller and variously colored birds, among which are such familiar American friends as the brown thrasher and its many cousins of the Southwest; the saucy, mewling, catbird—a frequenter of every garden and blackberry thicket in the land; these busybodies the wrens, and many others.

WRENS

One would not at first glance connect the great long-tailed brown thrasher with the tiny garden-wren which stuffs a hole

in one of the barn timbers or a crevice in a broken tree with a mass of twigs surrounding a soft little bed for the red-sprinkled eggs; but when you closely compare the shape of bill and feet, and their general form and manners, the resemblance becomes more plain. Then you are not surprised to find the rough nest and speckled eggs of the big thrasher and the tiny wren much alike, and to find a resemblance in their songs, much as they differ in loudness.

Wrens have a curious way of beginning to build nests, and leaving them half finished. These are sometimes supposed to be the work of the male bird alone, and are called cocks' nests; and certainly the cock does not seem to take any part in building the true nest, for he simply sits on a branch close by and sings, while the hen does all the work. Perhaps he is lazy; or perhaps she thinks that she can build much better than he can, and so will not let him help her. And therefore it may be that he makes these cocks' nests just to show her what he can do. But as wrens are very timid birds, and will often desert their nest if one even puts one's finger inside, it seems rather more likely that they are nests which the birds have left unfinished because they thought that some enemy had discovered them.

THE DIPPER

Not unlike a very big wren with a white throat and breast is the curious and interesting dipper, well known to dwellers in the Rocky Mountains and the ranges west of them. It is never found far from water, and you may often see it perched upon a stone in the shallows of a river, bobbing up and down every now and then just as though it were making a courtesy. And every time that it does so it gives a quick little jerk to its tail, just as the wren does. It also makes a nest of moss, somewhat like that of the wren, which is placed in a hole in the bank of a stream, or often in a crevice of the rocks behind a cascade. It feeds on insects and water-shrimps, etc., and you may often see it busily hunting for the little beetles which are hiding among the moss on the large stones in the bed of a stream, where it actually walks on the bottom. It can swim and dive

perfectly well, and keeps itself beneath the surface by flapping with its wings, while it searches for grubs in the mud at the bottom of the water. The dipper has a very bright and gay little song, and always seems happy, and busy, and active.

SWALLOWS AND MARTINS

Swallows and martins form a very distinct group of small birds well known to everybody, for no one can help noticing them as they sail through the air in swift graceful circles or skim low over the water in constant pursuit of the tiny flies which form their fare, and are so small that vast numbers must be caught. Familiar, too, is their coming in the spring, when they are welcomed as the special sign of returning pleasant weather after the season of cold storms; and in autumn we cannot but notice them gathering in large flocks along the telegraph lines or over the marshes, preparatory to departing to their winter retreat in the tropics.

These characteristics, as well as their appearance—slender, long-winged, dark-colored—belong to the swallows and martins all over the world; and they are alike in all countries in their fearless fondness for making close acquaintance with mankind when he dwells in settled homes.

COMMON SWALLOWS

Naturally, these birds are inhabitants of caves and rocky cliffs, or of hollow trees; but, like the swifts, the moment a man builds a house or barn in Europe, or Asia, or South America, there certain swallows are sure to come to live with him, just as they do around our village and farm houses in North America. Hence the English people call their common species house-swallow, and we give the name barn-swallow to our similar one. This is the very common species with the long, deeply forked tail, which sets its nest of mud and straw on the beams of our barns or plasters it against the walls or roof, always *inside* the building. Almost equally widespread and numerous is another barn-loving kind, distinguished by its short square

tail and its habit of forming bulb-shaped nests wholly of mud, and of placing them in rows *outside* the building, close up under the eaves. These last are better known as eaves-swallows.

WELL-KNOWN MARTINS

Martin is a name applied to various swallows, but with us it denotes the big purple one which in the warmer parts of the country gladly takes possession of the pretty bird-houses which many persons set on poles in their gardens.

Another smaller, sooty-brown martin, is the sand-martin, or bank-swallow, which differs from all the rest in placing its eggs on a little bed of straw and feathers at the end of a long burrow which it bores into the face of a cliff of earth beside some river, where usually a large company live as happy neighbors. This species is one of the few birds known almost all over the world.

CHAPTER XXIV

PARROTS, PIGEONS, PEA-FOWL, PHEASANTS, Etc.

THE members of the parrot family are very interesting birds; in the first place because they are generally so gaily colored, in the second place because they are so easily tamed, and in the third place because many of them are such capital talkers. They nearly all spend the greater part of their lives in the trees, and if you look at their feet you will see that the first and fourth toes are turned backward while the second and third are directed forward. This gives the birds a great power of grasp, and helps them in climbing.

At least five hundred different kinds of these birds have been discovered in different parts of the world, but we shall only be able to tell you about a few of them. Let us take first a parrot, then a parrakeet, then a cockatoo, then a macaw, and then a love-bird, as representing the various groups.

THE GRAY PARROT

We take this parrot because it is the one which we see most often in cages. It comes from Central Africa, and, like most parrots, is generally seen in large flocks, which fly about together. During the daytime these birds often travel long distances in search of food, which consists chiefly of fruits and nuts, but in the evening they always return to their regular roosting-places.

This parrot makes no nest at all, but just lays its eggs in a hole in the trunk of a tree. Both birds sit in turns, and if danger threatens they will defend their eggs or their little ones with the greatest courage. And if they seem to be getting the worst of the fight, it is said that the rest of the flock will come to their rescue, and will nearly always succeed in driving the enemy away.

When they are kept as pets gray parrots nearly always learn

to talk well, and sometimes make such suitable remarks that it really almost seems as if they must understand what they say. That they live to a very great age appears certain from the fact that they have sometimes been kept in captivity for seventy or eighty years.

PARRAKEETS

These birds are found in the hotter parts of Africa, Asia, and Australia, being very plentiful, for instance, in the forests of India. Perhaps the best known of them is the East Indian ring-necked parrakeet, which is green in color, the male having a red ring round his neck, with a black ring underneath it. The length of the bird is about seventeen inches, of which almost exactly half is taken up by the tail.

These parrakeets are dreadfully mischievous birds, for they visit both fields and gardens, and devour enormous quantities of grain and fruit. You can easily understand how much harm four or five hundred of them can do in a short time, and flocks of this size are often seen, while sometimes they are even larger still. They have regular roosting-places, to which they always return at night; and they lay their three or four white eggs in holes in trees.

COCKATOOS

Cockatoos may easily be recognized by their feathery crests, which they can raise and lower at will. We will take the sulphur-crested cockatoo as our example.

This favorite cage-bird comes from Australia, where it is found in enormous flocks. Fancy seeing a thousand cockatoos flying about together! And fancy what it must be to listen to their screams! Yet a flock of this size is not at all uncommon. The birds are not as plentiful as they used to be, however, for they did so much mischief in the grain-fields that the planters shot them in large numbers; often, indeed, a field would be so full of cockatoos that from a little distance it looked as though it were deeply covered with snow.

As talkers cockatoos are not nearly so clever as parrots, but they soon learn to imitate all kinds of sounds, such as the barking of dogs, the mewling, of cats, the cackling of fowls, and the gobbling of turkeys. Unfortunately, however, they are very fond of screaming, and make a terrible outcry if they are annoyed in any way, so that they are apt to be rather a nuisance if they are kept as pets.

MACAWS

The macaws are large and handsome birds, their plumage being nearly always very brightly and even gaudily colored. In the red and blue macaw, for instance, which is one of the best known, the general color is bright vermilion red, with a patch of yellow feathers on the upper part of each wing. Then the lower part of the back, together with the quills of the wings and the outside feathers of the tail, is blue, while the central tail-feathers are scarlet with blue tips. But even this is not all, for underneath the wings and tail are golden red, varied by patches of yellow feathers tipped with green. This magnificent bird is nearly three feet long, two-thirds of that length being occupied by the tail.

Macaws are found in large flocks in the great forests of tropical America, where they may be seen sometimes flying high in air, and sometimes sitting on the topmost branches of the tallest trees. Their cries can be heard from a very long distance away.

Macaws are just as mischievous in the cornfields as parrots and cockatoos are in other parts of the world, and are much more difficult to kill; for some, before settling down to feed, post sentinels in the tops of tall trees near by, and steadily watchful, they give the alarm as soon as they see the slightest sign of danger.

Macaws lay their eggs in holes in tree-trunks, as parrots do, and are said to enlarge the holes to suit their requirements by means of their powerful beaks. They are not very wise birds, however, for when they are sitting they often leave their long tails projecting out of the hole, to be seen by every passer-by!

LOVE-BIRDS

Of all the birds which belong to the parrot family the love-birds are the smallest, being little bigger than finches. Seven different kinds are known, all found in Africa south of the Desert of Sahara.

These pretty little creatures are called love-birds because they seem so very fond of one another. If two or three are kept in a cage together, they always snuggle up as closely as possible, and will sit side by side for hours, perfectly happy in each other's company. And often, if one of a couple dies, the other will pine away in a short time and die too, apparently from sorrow.

In a wild state love-birds are generally seen in small flocks which fly very rapidly, and constantly utter their sharp screaming cry. They do not seem to make any nests for themselves, but make use of those of other birds instead. Whether they turn out the rightful owners, however, or merely take possession of nests which have been deserted, nobody seems to know.

PIGEONS

We shall only be able to tell you about two members of the great pigeon family, the first of which shall be the wood-pigeon, or ring-dove, which is interesting as the wild original that has given us our domestic pigeons, so many varieties of which have been produced by fanciers.

This is a very common bird in almost all parts of the British Isles, and one can scarcely walk through a wood without startling it from its retreat in the thick foliage of some tall tree; or ramble through the fields without seeing at least one flock on its way to its feeding-grounds. Unfortunately, it does a good deal of mischief, for it has a most enormous appetite, and carries off immense quantities of grain from the cornfields. Just to give you some idea of the amount of food that it will eat, we may mention that no less than eight hundred grains of wheat have been taken from the crop of a single wood-pigeon, six hundred peas from that of another, and one hundred and eighty beech-nuts from that of a third; while one naturalist tells us that the

bird will sometimes pack away enough turnip-tops to fill a pint measure when they are well shaken up!

Our American turtle-dove, or mourning-dove, is much like this, but nobody minds the few bits of grain it picks up. On the other hand, the wood-pigeon devours great quantities of the seeds of weeds; so although it is mischievous in one way, it is useful in another.

The nest of the wood-pigeon, which is mostly placed in the upper branches of a tall tree, is very clumsily made. Indeed, it is very little more than a platform of sticks, which are often so loosely put together that as you look up from below you can see the eggs through the gaps between them! There are never more than two eggs, which are perfectly white.

THE PASSENGER-PIGEON

The passenger-pigeon, or wild pigeon of North America, was remarkable for two reasons.

In the first place, it used to be found in the most astonishing numbers. Flocks of these birds *many miles in length* were often seen, while large tracts of forest were once so thronged with their nests that all the smaller branches and many of the larger ones were broken down. Fancy what that means when a nesting-place is thirty miles long and several miles broad, while as many as a hundred nests may be found in a single tree!

In the second place, the bird was renowned as a traveler. That was why it was called the passenger-pigeon. All over the length and breadth of the country a few years ago these vast flocks would fly, coming no man knows whence, going no man knows whither, roosting just for one night in one place, and passing on again early next morning. But no longer can a passenger-pigeon be seen. Men destroyed the young birds, drove the old birds from their nests, and the passenger-pigeon became extinct. The last specimen died in the Cincinnati Zoölogical Park in 1914.

PEACOCKS

What a magnificent bird the peacock is, with his great train raised and spread so as to show off all the beautiful eye-like

markings! And how *very* proud of it he seems as he struts about to be admired, as though knowing quite well that everybody is looking at him!

People sometimes speak of this train as the "tail." But it really consists of those feathers which are called the tail-coverts, the true tail lying underneath it, and serving to support it when it is spread.

Peacocks are natives of Asia, and are found most commonly, perhaps, in India, where flocks of thirty or forty may often be seen, and one traveler tells us that he once saw quite fifteen hundred of these splendid birds all together! They are sometimes caught in a very curious way. The hunter rides up quietly to within a short distance of them as they are feeding on the ground, and then suddenly dashes at them at full speed. Of course they at once rise into the air, and just as they are passing out of reach he strikes at one of them with a very long whip, which coils round its neck like a lasso. Then all that he has to do is to pull it down to the ground.

In some parts of India, however, these birds are regarded by the natives as sacred, and no one is allowed to kill them, or even to take them alive.

TURKEYS

Everybody takes an interest in the turkey—more especially at Thanksgiving and Christmas time!—and many people think that it comes from the country of Turkey, but this is quite a mistake, for it is a native of North America, in many parts of which it is still found in great abundance. The domesticated turkey probably arose from the Mexican variety rather than from the more familiar wild turkey of the Northern States.

Some of the flocks seem to consist of cock birds only, and others of hens and young, the reason being that the cocks are very fierce and quarrelsome birds, and will attack and even kill the young ones if they have an opportunity. Until long after her little ones are fledged, indeed, the mother turkey has to take the greatest care of them; for not only are they in constant danger from their unnatural father, but all kinds of other ene-



AMERICAN GAME BIRDS

1. Wood-duck.
2. Pheasant.
3. Green-winged Teal.
4. Yellow-legs; Tattler.
5. Widgeon Duck.
6. Canvas-back.
7. Canada Grouse.
8. Quail; Bobwhite.
9. Woodcock.
10. Virginia Rail.
11. Common Snipe.
12. Common Snipe.

mies, such as foxes, lynxes, and horned owls, have to be guarded against as well. So she keeps them nearly always under cover, and when at last they are big enough to be taken for a little ramble, she never brings them back to the nest by the path by which they left it.

Turkeys often travel for very long distances. When they come to a broad river they perch in the upper branches of the tallest trees they can find, and then fly across together at a given signal. They are not very strong on the wing, and usually some of them fall into the water. But by spreading out their tails and paddling hard they generally manage to make their way to shore.

PHEASANTS

The pheasant is a native of Southeastern Europe and Asia Minor; but it has lived in Western Europe for so long that it is fully entitled to rank among British birds. Attempts have been made with varying success to introduce it into America. It has so many enemies that it must be carefully preserved.

Pheasants nearly always live in woods, though they often venture out into the open fields to search for food, which consists of acorns, grain, beechnuts, seeds, and small insects. During the winter, however, they have to be fed, or they would be very likely to die from starvation.

These birds do not make a regular nest, the hen merely scratching a slight hollow in the ground, and there laying her ten to fourteen olive-brown eggs. When she is sitting it is difficult to see her, for her light-brown mottled plumage looks just like the dead leaves among which she is resting, and even the sharpest eye might often pass her by.

THE RED GROUSE

This bird is remarkable for two reasons. The first is, that it is found only in the British Isles, and not in any other part of the world; and the second is, that it varies so very greatly in color. Sometimes it is almost entirely black, sometimes it is

reddish chestnut, and sometimes nearly all the feathers are broadly tipped with white.

The red grouse is found on moors and mountainsides wherever there is plenty of heath or heather, and where it can obtain the whortleberries, cranberries, and tender shoots of cotton-grass and sedge upon which it feeds. And though it has many natural enemies, such as hawks and crows, foxes and stoats, and while it is shot in thousands by sportsmen, it never seems to decrease in abundance.

As a general rule the grouse does not fly much, but runs with great swiftness among the heather. It makes a very rough nest of straws and twigs in a hollow in the ground, and often sits so closely on its eggs that it may almost be trodden on before it will move. When the little ones are hatched they seem to know without being taught how to conceal themselves in moments of danger, and if they cannot find cover will flatten themselves against the ground, where they look so much like stones that even the sharp eye of a hawk will pass them by.

PARTRIDGES

Partridges, of which our quail is an example, are found almost everywhere, being carefully protected in most countries for purposes of sport; and they lay so many eggs that they are scarcely likely to become less plentiful. Few nests contain less than ten eggs, while fifteen or even more are frequently laid; and instances have been recorded in which as many as thirty-three eggs have been found in a single nest, but in these cases two birds have most likely laid together. The mother bird sits very closely—so closely, indeed, that when she has nested in a meadow and the grass is being mown, she often fails to move out of the way of the scythe in time, and is found lying on the ground with her head cut off after the reapers have passed by.

When the little ones are hatched, both parents go about with them, and the covey, as it is called, keeps together all through the autumn and winter.



FOUR GREAT GAME-BIRDS.

1. American Wild Turkey.
3. European Blackcock.

2. European Great Bustard.
4. South American Chaha.

CHAPTER XXV

OSTRICHES, HERONS, CRANES, IBISES, Etc.

THE ostrich is a very remarkable bird indeed.

In the first place, it is by far the largest of all living birds, for a full-grown male ostrich is taller than a very tall man. Then its head is somewhat like that of a camel, and its neck like that of a giraffe—very long and slender, with scarcely any feathers on it. Next, its wings are so small that they cannot be used for flight. All that an ostrich does with its wings, indeed, is to spread them out when it is running, so that they may help it in keeping its balance. And, finally, its legs are as stout and as strong as those of a horse, while it has only two toes on each foot.

Ostriches live in the great desert plains of Africa, where they are mostly found in small flocks. Although they cannot fly, they can run with very great speed, and in fair chase will distance even a swift horse. But for some strange reason they always run in circles, so that all that a hunter has to do is to notice whether they are swerving to the right or to the left, and then to gallop across and cut them off.

When an ostrich is running at full speed it takes most wonderful strides, its toes scarcely touching the ground as it dashes along. By careful measurement, indeed, it has been found that there is sometimes a distance of no less than twenty-eight feet between its footmarks!

The ostrich is rather a formidable bird, for it can kick forward with terrific force. But if a man lies down when attacked by one he is fairly safe, for the kick cannot be properly delivered at a height of less than three feet. Or if he has a forked stick he can hold the bird back by pressing the fork against its neck.

Ostriches' eggs are so large that one of them will make a good meal for eight men. The bird does not make a nest, but scoops out a hollow in the sand about three feet across and a

foot deep, and then arranges its eggs in it, each egg standing upright, and being lightly covered with sand. Twenty eggs or more are often hatched together, and in addition to these the bird generally lays a number round the edges of the hole, which appear to serve as food for the young. During the day the hen sits, the cock taking her place by night.

The appetite of the ostrich is proverbial, and it would really be difficult to say what an ostrich will not swallow. Stones, coins, bunches of keys, tobacco-pipes, newspapers done up for post, brickbats, old shoes, and tenpenny nails have all been taken from its crop; and it seems to be very seldom indeed that any of these things disagree with it! Its natural food, however, consists chiefly of wild melons, which also supply it with all the moisture that it needs.

Ostriches are very valuable to man, on account of the beautiful plumes which are obtained from the male. These birds are therefore kept in great numbers in ostrich-farms so that the plumes may be regularly cut once in every year. As this does not destroy the bird, it is proper to make use of these beautiful feathers as ornaments.

THE EMU

In Australia the place of the ostrich is taken by the emu. It is a smaller bird, however, though a full-grown hen—which is bigger than the cock—is often six feet in height. And it has three toes upon each foot instead of two.

The emu was formerly very common in many parts of Australia, but it has been so terribly persecuted that it is fast becoming exceedingly scarce. It is generally hunted with dogs, which are trained to spring at the neck, so as to be out of reach of the terrible feet. For the emu does not kick forward, as ostriches do, but strikes sideways and backward, like a cow.

The emu only lays six or seven eggs, which are of a beautiful dark-green color, without any markings at all. They are laid in a hollow scooped in the ground. During the nesting-season the female bird utters a loud booming sound, which is due to a very curious pouch in the throat.

RHEAS

There are also several ostrich-like birds in South America which are known as rheas. They inhabit the Argentine plains, and are not nearly so large as the ostrich and the emu, but are quite as swift of foot, so that it is not at all easy for a man mounted on even a fast horse to overtake them. They are generally hunted with the bolas which is a long cord with a heavy ball as each end, and is flung at the bird in such a manner as to wind round its neck and hold it prisoner.

Rheas always lay their eggs in hollows in the ground, and the number of eggs in a nest seems to vary from twenty to twenty-four. The male bird, apparently, sits upon them, the hen taking no part in the task of hatching them out. Neither does she seem to take any care of the little birds when at last they make their appearance, for they always travel about with the cock.

CASSOWARIES

Of these there are a good many kinds. They are formed like the ostrich and the emu, but have shorter necks, which are sometimes wattled and are marked with patches of brilliant red and blue and green. The legs are stout and the feet are perfectly enormous. But their most striking feature is an odd bony crest upon the top of the head, which is covered with naked skin.

Cassowaries are found only in Australia, New Guinea, Ceram, and some of the neighboring islands, and, unlike all the preceding birds, are dwellers in the forest. They are so shy that they are very seldom seen, so that we do not know very much about their habits. The Australian natives, however, often keep them in captivity, and treat them almost as we treat poultry. But they are rather dangerous creatures, for they can kick very hard with their great, strong feet, and are very ready to attack any one who is a stranger to them.

Cassowaries only lay from three to five eggs, and it seems

that the cock bird alone sits on them, and that he also takes care of the little ones after they are hatched.

KIWIS

More curious still are the kiwis of New Zealand, whose wings are so very small, and so completely concealed under the feathers of the body, that practically they may be said to have none at all. Besides this, the beak is so long and slender that it reminds one of that of a woodcock or a snipe. The nostrils are placed at the very tip of this beak, which the bird appears to use by plunging it deeply into soft ground, and then smelling for worms.

When it finds a worm it seems to coax rather than to pull it out of the ground, and then throws up its head and swallows it whole.

Kiwis have several times been brought to the London Zoo, but hardly any one ever saw them, for all day long they were fast asleep among their straw. If the keeper took them out and woke them they would just yawn once or twice, opening their beaks to the widest possible extent, and then fall fast asleep again.

After dark, however, these birds become very lively, and will run with such speed that even a dog can scarcely overtake them. This shows that their natural habit is to go abroad and seek their food during the night.

The egg of the kiwi is enormously large. Indeed, it is almost a quarter of the size of the bird itself, and when two eggs have been laid and the bird is sitting on them, the ends project beyond the feathers on either side of its body.

BUSTARDS

The bustards also are able to run very well, and unlike the birds belonging to the ostrich family, they are also able to fly.

The finest of these birds is the great bustard, which until about the year 1840 was found wild in Great Britain. The cock is between three and four feet in height, and the head and

body together are nearly four feet long, while when the wings are fully spread they measure quite eight feet from tip to tip. The hen is a good deal smaller.

The great bustard lives in wild, open plains, and is so extremely wary that it is almost impossible to approach within gunshot. Except during the nesting season it is found in small flocks, and both by day and by night two of the party act as sentinels and stand always on the watch, ready to give the alarm at the first sign of danger. They have wonderfully sharp sight, and will detect a man long before they can be seen by him. Almost the only way to shoot them, indeed, is to dig a pit in the ground and hide inside it, covered over with branches, until they pass by.

These magnificent birds are now found chiefly in the steppes of Eastern Europe and Asia, where they feed upon seeds and grain, and also upon insects and even upon small animals. They lay two or three eggs in a hollow in the ground, in which sometimes, but not always, they place a few grass-stems by way of a nest.

CRANES

Another tall and stately bird is the crane. It is found in one or another species in all quarters of the world, living on plains and marshes, coming north to breed, and retiring southward again during the winter.

Cranes generally travel about in flocks, which nearly always fly in the form of a wedge, each bird having its long legs stretched stiffly out behind it. Each flock is under the guidance of a leader, and the birds are most careful when they alight to do so in some open place where they can see for a long distance in every direction, so as to guard against the danger of being surprised by an enemy.

Cranes are generally to be seen in marshy districts, where they can find plenty of frogs, newts, and worms. But sometimes they will make their way to a newly sown field and dig up all the grain. Their nests are generally placed on the ground, among osiers or in reed-beds, though now and then

they will build on the very top of an old ruin. The little brown crane of the western plains is the most familiar American species.

The crowned crane, which is found in Northern and Western Africa, is a very odd-looking bird, for it has a large bunch of upright golden feathers on the top of its head, and a scarlet wattle on the throat. From a little distance it really looks as if it were wearing a bright yellow bonnet, tied with a bow of scarlet ribbon under its chin!

LAPWINGS

The European lapwing, known to every one by the familiar reference in Tennyson's "Locksley Hall," represents the world-wide family of plovers. They are beautiful birds with their black and white plumage and the tuft of long feathers at the back of the head, and very often one may see hundreds or even thousands of them together. Early in the spring one may find their four long, pointed eggs, which are olive brown in color, spotted and blotched with brownish black, and are always laid in a little hollow in the bare ground with their small ends inward in the form of a cross. But somehow or other, although they are quite large eggs, it is very difficult to see them, and you might pass close by a dozen nests, and even look straight at them, and yet never notice the eggs at all.

Often, when some one happens to find a hen lapwing sitting on her eggs, she will pretend to be wounded, and will flap and tumble along the ground in the hope of making the intruder chase her, and so of leading him away from her nest.

Sportsmen know of many other plovers, such as the golden, the ringneck, the killdee, or killdeer, and several more, both American and foreign.

THE CURLEW

This is another plains-bird common to both continents, which may often be noticed on moors or in marshes during the summer, or on the sea-coast in the winter. But generally one only sees it

in the distance, for it is extremely wary, and takes to flight at the very slightest alarm.

All through the winter months curlews live in flocks, and one may hear them uttering their mournful cries in chorus together. But early in the spring they separate, and each pair selects some little hollow in the ground which may serve as a nest. In this they lay four pear-shaped eggs, which are olive green in color, spotted with gray and brown. When the eggs are hatched the parents take the greatest care of their little ones, and often if any one comes too near the nest they will fly round and round his head in the most excited manner, and do their very best to drive him away.

In color the curlew is pale brown above, with darker spots and streaks, and grayish white beneath. Its total length is about twenty-four inches, and the beak is long and slender, with a downward curve.

RUFFS

The ruff, a relative of the curlew, is remarkable for three reasons. In the first place, during the breeding-season, the male bird has a great frill or ruff of long feathers round his neck, which he can raise and lower at will. In the next place, two male ruffs are never colored alike, while sometimes they look so wholly different that it is quite hard to believe that they can really belong to the same species. And, in the third place, they are so dreadfully quarrelsome when the nesting-season begins, that two male ruffs can never meet without fighting. More than that, they actually have regular fighting-places, to which numbers of the birds resort when they want to settle their quarrels! But although they fight very savagely, they never seem to do each other much harm.

Ruffs are hardly known in America, except in Alaska, but at one time they were very common in the marshy parts of England.

THE WOODCOCK

The woodcock is a bird of wooded swamps. It is valued by sportsmen, because difficult to shoot and delicate to eat. They

lay their eggs in a hollow in the ground, which they line with dry grass and leaves. When the mother bird is sitting it is almost impossible to see her, for she nearly always nests among dead ferns, which are of exactly the same hues as her own plumage. Generally, indeed, it is her eyes that are noticed, and if she only had the sense to keep them shut she would probably never be detected at all.

Woodcocks are hardly ever seen unless they are disturbed, for they hide during the daytime in thick bushes in woods, and only come out to feed in the evening. Their food consists chiefly of worms, which they pull out of soft, muddy ground by means of their long, slender beaks.

If two male woodcocks meet during the nesting-season they almost always quarrel, and will fight nearly as savagely as ruffs.

THE SNIPE

In appearance and habits the snipe is something like the woodcock, but it is considerably smaller, and is found in damp, marshy ground instead of in woods. When it is flushed it flies away for a few yards quite straight, and then begins to twist and turn about in a most extraordinary way, changing the direction of its flight at almost every yard. In consequence of this habit it is not at all an easy bird to shoot.

The male snipe is very fond of rising to a great height in the air, and there uttering his curious cry of "chick! chick! chick-a!" over and over again. At the same time he also makes a strange drumming sound, which seems to be caused in some way by the motion of the wings, as it is only produced while he is "stooping" down toward the ground.

The snipe generally nests in the middle of a tussock of coarse grass or rushes, where it lays four buff or olive-green eggs marked with dark-brown blotches.

THE HERON

One of our finest American birds is the heron, which you may often see flying high in the air, with its long legs stretched stiff

ly out behind it. And sometimes you may see it standing quite motionless in the shallower parts of a stream, watching for the fishes on which it feeds. After a time it will slowly stoop, plunge its long beak into the water, and draw it out again with a minnow, or a perch, or a frog struggling in its grip. Then it holds its beak almost upright, gives a gobble and a gulp—and the fish or the frog disappears!

The heron feeds largely on frogs, mice, insects, and worms, as well as upon fishes. And more than once it has been known to capture and swallow a small snake.

Hérons build their nests in the upper branches of tall trees, making them of sticks and twigs, lined with grass and roots. A number of these birds generally nest together in the same clump of trees, just as rooks do, and in each nest are laid either three or four bluish-green eggs, without any markings at all.

If a heron is attacked, it uses its long, dagger-like beak with great readiness, and always tries to strike at the eyes of its enemy. Herons are of many kinds, the great blue one being the finest of the tribe.

STORKS

The stork is found in most parts of Europe, and also in Asia and Northern Africa.

When storks are migrating, they fly in great flocks, which sometimes consist of many thousand birds. As soon as they arrive, they spread themselves over the country, being especially fond of marshy districts, where they can find plenty of frogs, toads, lizards, and the other small creatures upon which they feed. But they also devour large quantities of the offal which they find in the streets of the villages and towns.

In Holland and Germany storks breed in great numbers. Their nests, which are usually placed on the tops of chimneys, are little more than clumsy piles of sticks, and as fresh sticks are added every year, they gradually get bigger and bigger until at last they reach a very great size. From three to five pure white eggs are laid, and the young birds remain in the nest until they are well able to fly.

The American representatives of the stork family are the jabiru, found in tropical America, and the wood-ibis which is plentiful in the southern States of the United States, especially Florida.

THE IBIS

Very much like storks in some ways are the ibises, which are found in many parts of Asia, Africa, and America. They are generally found in flocks, which live in marshes or on the banks of rivers and lakes, where they spend most of their time dabbling in the water with their long beaks in search of food.

One of these birds was worshiped by the Egyptians of old, who treated it with the greatest reverence during life, and carefully embalmed its body when it died. For this reason it is known as the sacred ibis, and in every large art museum you may see ibis mummies, which were taken from the tombs of the kings. In color this bird is snowy white, with a black head and neck, and long black plumes on the hinder part of the back. You may generally see it in a zoo, together with the beautiful scarlet ibis, whose plumage is bright red in color, with black tips to the wings.

CHAPTER XXVI

SWIMMING BIRDS

IN the birds belonging to this group the feet are webbed, so that they may be used as paddles. And some of them are very curious indeed.

FLAMINGO

First of all, there is the well-known red and white flamingo, which is quite an extraordinary bird, for it has extremely long, stilt-like legs, and an extremely long, snake-like neck, which it can twist and coil about as easily as if it were just a piece of rope. There is no part of its body which a flamingo cannot reach with its beak, so that it can preen its feathers quite easily. And when it wants to feed it wades into the water, bends down its long neck, turns its head upside down, so that its forehead rests upon the bottom, and scoops up great mouthfuls of mud. Then, by means of the grooves at the sides of the bill, it gets rid of the mud, while all the grubs, etc., which were lying buried in it, are left behind to be swallowed.

The nest of the flamingo is a cone-shaped heap of mud, sometimes as much as two feet high, with a little hollow at the top to contain eggs. Thousands of these birds nest together, and when they are sitting they look just like a great rosy-white cloud resting upon the ground. And if they are startled and fly away, their nests look as though hundreds of children had been making big sand-pies on the beach and neatly arranging them in rows. But such a sight as this can now be seen only in some almost inaccessible tropical islands, for these birds have been greatly persecuted by feather-hunters and others, and are rare everywhere near civilization. They used to be common in Florida and all about the Gulf of Mexico, where now only a few exist.

Flamingoes are found in the warmer parts of all the great continents except Australia. Nine different kinds are known, some of which stand well over six feet in height.

GEESE, SWANS, AND DUCKS

Of wild geese there are at least forty species, which are found in almost all parts of the world.

The graylag goose which breeds in the British Isles, seems to be the ancestor of the domestic geese that we see in every farmyard. It lives in flocks, which frequent marshes, lakes, and boggy moors during the greater part of the year, but often visit the sea-coast in winter. Sometimes, too, they may be seen near the mouth of a great river. They are very shy birds, and when sportsmen wish to shoot them they have to resort to all kinds of tricks in order to approach them without being seen.

When wild geese fly, they generally do so in the form of a half-opened pair of compasses, with the angle in front. But now and then they may be seen in the air in an irregular wavy line. As they fly they make a curious "gagging" cry, which can be heard from a very long distance.

The nest of this goose is made of grass and flags, and is generally placed at the base of a tussock of coarse grass. It usually contains six plain white eggs.

Swans, too, are found wild in many parts of the world, and used to be almost as numerous as ducks or geese both on the inland lakes and along the coasts of the United States, but now have become rare and shy. All the species breed in the arctic regions, and appear among us only on their migrations in spring and fall.

Swans are most graceful birds in the water, and as their limbs are set very far back they can swim with great ease. But for the same reason they are very clumsy upon dry ground, and waddle along in the most awkward way, seeming to find it very difficult to keep their balance. All those in our parks are tame; but during the nesting-season the male swan generally becomes very savage, and will attack any one who ventures too

near to his nest. And as a single stroke from his wing is sufficient to break a man's arm, he is apt to be dangerous when unfriendly.

The nest of the swan is a very large structure of reeds, rushes, and grass, and is generally placed quite close to the water's edge. It contains six or seven large greenish-white eggs.

A great many kinds of duck are known, but we can only mention the common wild duck, which still visits rivers and lakes every winter in considerable numbers, a few of which remain to breed.

The male duck is called the mallard, and from October till May he is a very handsome bird, with a dark-green head and neck, a white collar round the lower part of his throat, brownish-gray wings, chestnut-brown breast, and white hinder parts. But when he moults he puts off this beautiful plumage, and for the next five months is mottled all over with brown and gray, just like his mate.

Wild ducks are found chiefly in marshes and fens, and on the borders of rivers and lakes. But when they come over in the autumn they often spend the daytime out at sea resting on the water. They make their nests of grass, lined with down from the mother bird's own breast; and the little ones are able to swim as soon as they leave the egg-shell. When they are about half grown they sometimes use their wings in diving, and you may see them flapping their way along beneath the surface, and really flying under water.

CORMORANTS

In Great Britain, due to its northern latitude, cormorants are commonly seen where the coast is high and rocky; but in America they are less often visible because they dwell mainly in the far north. They are very odd birds. Sitting on rocks which overhang the water, every now and then one will drop into the sea, splash about for a moment or two, and then return to his perch. Then you may be quite sure that he has caught and swallowed a fish. Sometimes you may see them swimming along with their heads under water, watching for victims in the depths below.

Cormorants are famous for their big appetites—perhaps it would be more correct to say for their horrible greediness, for they will go on eating till they simply cannot swallow another morsel, and yet will try hard to catch every fish that comes near them. The little ones feed in a most extraordinary way, for they actually poke their heads down their mother's throat, and take as much food as they want from her crop!

When these birds really feel that they have had enough to eat, they sit upon a rock for an hour or two while they digest their dinners. They also take this opportunity to dry their wings, and spread them out to the fullest extent on either side, so that they look very much like rows of black clothes hung out to dry!

In China cormorants are often trained to catch fish for their masters, a strap being fastened round the lower part of the neck to prevent them from swallowing their victims. They were formerly used in England in just the same way.

PELICANS

More curious still are their cousins the pelicans, which have a pouch of naked parchment-like skin under their long bills, capable of holding quite two gallons of water. This pouch, as a rule, is folded closely up under the beak, but when the bird is fishing, it packs victim after victim into it until it is quite full, when it really looks almost half as big as the body.

In this way pelicans carry back food for their hungry little ones. But on their way they are sometimes robbed, for there is a kind of large hawk which is very fond of eating fishes, but is not at all fond of the trouble of catching them. So he waits till he sees a pelican returning home from a fishing expedition, and then dashes at it, and begins to beat it about the head with his wings. The poor frightened pelican, thinking that it is about to be killed, opens its beak to scream. This, of course, is just what the hawk wants, and snatching a fish out of the pelican's pouch, he flies off with it in triumph.

Pelicans are very plentiful in many parts of the world, and are often seen in vast flocks. We have two kinds in the United



AMERICAN WADING BIRDS.

1. Great White Egret.
3. Great Blue Heron.
5. White Pelican (Male).

2. Sandhill Crane.
4. Whooping Crane.
6. Snow Goose.

States and Canada—the white and the brown. Both are more numerous on the marshes and around the shallow lakes of the northwestern plains than anywhere else, because they have been driven from their former coast-resorts. All the birds in a flock will sometimes go out fishing together. Arranging themselves in a great semicircle, about a yard apart, they all paddle slowly forward, and in this way will drive a great shoal of fish into shallow water, where they may be snapped up without difficulty.

SEA-GULLS

These you know very well by sight, for they are common on all parts of our coasts, and on many of our lakes, while numbers of them may be seen even on the ornamental waters in the parks of New York and other seaboard cities. In stormy weather, too, they often fly inland, and sometimes great numbers of them may be seen in newly plowed fields, hunting for worms and insects. Most of them go north for the breeding-season, some visiting certain islands and rocky cliffs in immense numbers, and making their nests of seaweed; while others, like the black-headed gull, and the ringbill nest in marshes, merely trampling down the broken tops of sedges and reeds, and so forming a slight hollow in which to lay the eggs.

At least fifty different kinds of gulls are known. But many of them are very difficult to distinguish, for their summer plumage may be quite unlike that with which they are clothed during the winter, while the young birds are not marked like their parents till they are two or even three years old. Those which are most common on the Atlantic coast are two or three kinds of herring-gulls, which formerly bred in great numbers on all our sandy shores and islets, but now have been driven to quieter regions in the far north. On the western plains, around certain shallow lakes, live great colonies of ring-billed and other small gulls, breeding in the extensive marshes.

Flying to and fro over the sea, or over a large inland lake, you may sometimes see a number of birds which look like gulls, but are much smaller, and have long, forked tails like

swallows. These are terns, or sea-swallows, as they are often called, and are most elegant and graceful in their movements, gliding and sweeping through the air, and twisting and turning with the most wonderful swiftness and ease. They are summer visitors only, coming to us in May and flying south again in September, and they breed on flat shores, generally laying their two or three eggs in a small hollow in the shingle. They feed on small fishes and shrimps, and also on the sandhoppers and the various insects which are so plentiful upon the beach.

GUILLEMOTS

Very common are guillemots on some coasts where there are sea-fronting cliffs, and freedom from disturbance. Thus they abound along the shores of Labrador and Greenland, and many varieties are to be found along the northern coasts of Alaska, and about the borders of the Arctic sea, often thronging in great numbers together with puffins, kittiwakes, petrels, and gannets, each kind occupying separate parts of the cliffs and living on friendly terms with their neighbors.

Guillemots feed entirely upon fishes, which they chase under water, using both their wings and feet, just as dabchicks do. They do not make any nest, but lay a single egg on a bare ledge of rock which is often only a very few inches wide. One would think that this egg would be in great danger of being knocked over the edge. But it is very large at one end and very much pointed at the other, so that if it is struck it only rolls round and round. In color it is green or blue, blotched and streaked with black.

THE ALBATROSS

One of the largest of all the sea-birds is the albatross, which is found chiefly in the tropical seas. When the wings are fully spread, they sometimes measure nearly twelve feet from tip to tip. Yet the entire weight of the bird is not more than sixteen or seventeen pounds. It often remains at sea for weeks or months together, sometimes remaining in the air all through the

night as well as all through the day, and following ships for hundreds of miles in order to feed upon the refuse which is thrown overboard. Its appetite is enormous, for it has been known to gulp down a great piece of whale's blubber, weighing between three and four pounds, and then to return almost immediately for more!

Great numbers of albatrosses nest together on uninhabited islands, each pair scooping together a quantity of clay, grass, and sedge, which they arrange in a conical heap about ten or twelve inches high, with a little hollow at the top. Only a single egg is laid, which is quite white, and is rather larger than that of a goose.

THE PUFFIN AND THE PENGUIN

Two most curious birds must be mentioned in conclusion. The first of these is the puffin, which is found plentifully in one or another species on all northern coasts where there are bold cliffs. An odder and more quaint-looking bird it would be difficult to imagine, for it has a beak quite large enough for a bird six times its size, while that beak, which is banded with bright crimson, gray, and brilliant yellow, looks just as if it had been stuck on with glue! More than that, it does not appear to fit very well; so that altogether, with its short, squat body and stout little legs, the puffin is by no means a graceful bird. It is often known as the sea-parrot.

On dry land, the puffin is very awkward, and can only waddle along slowly and clumsily. But it is a good swimmer and diver, and can chase and overtake small fishes with the greatest of ease. It is also able to fly very well, and takes long journeys over the sea when it comes to us in the spring, and again when it goes southward in the autumn. It makes no nest, but finds a cranny, digs out a hole in the face of a cliff to the depth of about three feet, and lays a single grayish-white egg at the end of the hole.

Odder still is the penguin, whose wings are but little more than flippers, with scales on their upper edges instead of feathers! It cannot fly, of course; but it uses its wings for two purposes. For if it is frightened upon land it throws itself down on its

breast and scuttles along on all fours, just as though its wings were legs, and if it wants to chase a fish in the sea it swims with them, just as though they were paddles.

There are a good many different kinds of penguins, all of which are found in the southern hemisphere. On some of the islands in the Pacific and Antarctic oceans they are found in immense numbers, and have a curious way of standing side by side upon the shore in long rows, with their flippers hanging down on either side of their bodies. From a distance, indeed, they might almost be mistaken for lines of soldiers standing at attention. When the breeding-season begins they become very busy, picking up stones, carrying them about with a great deal of fuss, and then carefully arranging them in position, every now and then turning their beaks up to the sky, waving their flippers, and making a curious gobbling noise. If a sitting hen leaves her nest for a little, all the other hens become greatly excited, and peck at her as she passes by in order to drive her back again, croaking loudly in chorus, and evidently feeling extremely indignant with her for neglecting her duties.

When these odd birds are sitting on a ledge of ice, and want to get down into the sea, they often throw themselves upon their breasts, and "toboggan" down the slope into the water!

REPTILES

CHAPTER XXVII

TORTOISES, TURTLES, AND LIZARDS

WE now come to the cold-blooded animals, which are divided into three classes. First we have the reptiles, whose hearts are formed of three chambers, and which breathe air by means of lungs. Next come the amphibians, which are like the reptiles in many ways, but which have to pass through a tadpole stage before they reach the perfect form. And, thirdly, there are the fishes, whose hearts are divided into two chambers only, and which breathe water by means of gills.

TORTOISES AND TURTLES

At the head of the reptiles stand the tortoises and turtles, whose bodies are shut up in a kind of horny box, which we generally call the shell. In reality, however, it is not a shell at all; for the upper part, which we call the carapace, is a development of the spine and the ribs, while the lower part, which is known as the plastron, is a development of the breast-bone. These animals, in fact, have part of their skeletons inside their bodies and part outside; so that they are really shut up in their own bones!

The so-called shell of a tortoise or a turtle is always very hard and strong, so that you can stand upon quite a small tortoise without hurting it in the least and in most cases the head and legs can be tucked away inside it, so that the animal is safely protected from almost every foe.

None of the turtles and tortoises have any teeth. But the edges of their jaws are so sharp and horny that they can often

inflict a very severe bite. Some of the larger turtles, indeed, could snap off the fingers of a man's hand as easily as you could bite through a carrot!

LAND-TORTOISES

The most famous of all the tortoises is the common land-tortoise, or Greek tortoise, which is found in many parts of the south of Europe, and also in Asia Minor. This is the animal which is so often kept as a pet, and about which so much pleasant literary interest has gathered. It does not grow to any great size, but will live in a garden for many years, crawling about by night as well as by day. Early in the autumn it buries itself underground, and falls into a deep sleep, from which it does not awake until the spring.

This tortoise is a vegetable-feeder, and is very fond of lettuce leaves, more especially when they are quite crisp and fresh, so that it can easily nip them to pieces with its sharp jaws. If they are rather old and stringy, it will hold them down with its front feet while it tears them asunder. And if you keep one of these animals as a pet, and want to give it a great treat, there is nothing that it likes better than a little milk. It is amusing to see how it drinks, for it first scoops up a little milk in its lower jaw, just as if it were using a spoon, and then holds up its head in order that the liquid may trickle down its throat.

There are a good many other kinds of land-tortoises, some of which grow to a very great size. The largest of all comes from the Galapagos Islands, and is quite a giant; for some of them are more than four feet long, and weigh between eight and nine hundred pounds! These huge creatures, however, are now nearly extinct.

TURTLES

The turtles are distinguished from the tortoises by the structure of their feet, which are flattened out in such a way as to serve as paddles in the water. For this reason these reptiles hardly ever come upon land except when they want to lay their

eggs; and they can swim so well that they are often met with many hundreds of miles out at sea.

One of the best known of these creatures is the hawksbill turtle, which is so called because its mouth is shaped just like the beak of a hawk. The carapace is made up of thirteen large scales, which overlap one another for about a third of their length, just like the slates on the roof of a house.

These scales are very valuable, for the best tortoise-shell is obtained from them. When they are first taken from the animal they do not look like tortoise-shell at all, for they are dull and crumpled and brittle. But after they have been boiled, and steamed, and pressed for some hours they quite change their character, and become so soft that they can easily be molded into any required shape.

The eggs of this turtle are laid in a hole which the mother scrapes in the sand, and are hatched by the heat of the sun. As soon as the little turtles make their appearance they hurry off as fast as they can toward the water. But they are very good to eat, and a number of hungry animals and birds are always on the lookout for them, so that a very great many are snapped up and devoured before they can plunge into the waves.

The famous turtle soup, which is considered so great a dainty, is made from the flesh of the green turtle, which is found most plentifully off the island of Ascension and in the West Indies. It grows to a great size, for it is often four feet six inches in length and three feet in breadth, while it may weigh nearly three-quarters of a ton. Of course it is not at all easy to capture such big creatures. But they are generally pursued when they come on shore to lay their eggs, and are turned over on their backs by means of a lever. They are then perfectly helpless, and can be left lying where they are until a number of others have been overturned in the same way, when they are lifted into a boat one by one, and are taken on board ship. There they thrive quite well if a pail of water is thrown over them two or three times a day, and are generally in very good condition when they reach this country.

It is said that if one of these turtles has once begun to lay her eggs in the sand, nothing will induce her to pause in her

task until she has finished it, and that even if the eggs are taken away from her as fast as she lays them, she will still go steadily on just as if she were undisturbed.

CROCODILES AND ALLIGATORS

Of course you know what these huge creatures are like. They are just enormous lizards, fifteen, or twenty, or even thirty feet long, with very short legs, and very clumsy bodies, and very long tails. And their great jaws are armed with rows of most terrible teeth.

But what is the difference between crocodiles and alligators? Well, in some ways they are certainly very much alike; but you can always tell them by the shape of their heads, for the muzzle of a crocodile is always narrowed just behind the nostrils, while that of an alligator is not. And in the crocodiles the fourth lower tooth fits into a notch in the edge of the upper jaw, so that you can distinctly see it even when the mouth is closed.

All these creatures live in the water, and spend a great deal of their time lying motionless on the surface, when they look like floating logs. One would think that they were fast asleep. But woe betide any animal which comes to drink from the bank close by, for one of the great reptiles instantly dives, swims swiftly along under water, and knocks it into the stream by a blow from its mighty tail.

There is scarcely any animal which does not fall a victim at times to these giant lizards. And as soon as the unfortunate creature is knocked into the water it is dragged beneath the surface, and held there until it is drowned. You would think that the reptiles themselves would be drowned, wouldn't you, as they have to remain submerged for many minutes with their jaws widely opened? But they have a very curious valve at the back of the throat, and as soon as the mouth is opened this closes so tightly that not even the tiniest drop of water can find its way down the throat.

Both crocodiles and alligators swim with very great speed by waving their powerful tails from side to side in the water. They can run, too, with some little pace upon land. But it is very



TYPES OF WATER-BIRDS

- | | | | |
|-------------------|--------------|-----------|-------------|
| 1. Mandarin Duck. | 2. Penguin. | 3. Heron. | 4. Pelican. |
| 5. Bittern. | 6. Flamingo. | 7. Crane. | |

easy to avoid them, for the bones of their necks are made in such a way that they cannot turn their heads, and all that one has to do if pursued is to spring suddenly to one side. But of course it is necessary to avoid the stroke of the tail.

The crocodiles always lay their eggs in the sand on the bank of a river. The eggs are about as big as those of a goose, and are generally buried at a depth of a couple of feet. The mother reptile always sleeps on the top of the nest, and it is said that when the little ones are ready to hatch out they utter a curious little cry. The mother hears this, and scoops away the sand under which they are buried, in order that they may have no difficulty in making their escape.

Crocodiles are found in the warmer parts of Africa, Asia, America, and Australia, and in some of the larger rivers are very plentiful. Just now and then they venture down into the sea. Alligators, which also are known as caymans and jacares, are only found in America and place their eggs in holes dug in the mud or earth beside the water. In the colder parts of the range they burrow under the mud of the banks and spend the winter in sleep.

THE LIZARDS

Lizards look at first glance like diminutive alligators, because most of them have long-jawed heads, short legs wide apart, and long tails; but really they are near relatives of the snakes, for not only their internal structure but the coat of scales is snake-like; but an important difference is that the jaws of the lizard are firmly hinged to a solid skull, while the bones of the skull of the snake, including those of the jaws, are connected by elastic cartilages which enable them to spread apart and permit the swallowing of a mouthful astonishingly large. But the lizards have no need of such a convenience, for they subsist almost wholly on insects, or else are vegetable-eaters. Lizards are almost entirely denizens of the tropics, and seem to rejoice in the fiercest heat. They will lie contentedly in the desert at noonday on rocks so hot that they would blister your hand if you touched them. Therefore few are to be found in Europe or North America, except in the extreme south.

THE BLINDWORM

Two or three small kinds are to be found in the south of England, one of which is curious as representing a tribe, largely represented in other parts of the world, of legless burrowing lizards, which look much like little snakes, for none of them are more than ten or twelve inches long, while they are of the thickness of a lead-pencil. They look so shiny and serpent-like that many people are afraid of them.

But the blindworm, or slowworm, as this creature is called, is perfectly harmless. It cannot bite you, for its teeth are far too tiny to pierce the skin; and it cannot sting you, because it has no sting. There is its odd little forked tongue, of course, which is always darting in and out of its mouth, just like that of a snake. But this tongue is only a feeler. Whenever a blindworm comes to an object it does not quite understand, it touches it gently all over with the tip of its tongue, just as we might touch it with the tips of our fingers.

Notwithstanding its name, the blindworm has a pair of very good, though rather small, beady black eyes; and, of course, it is not a worm.

During the daytime the blindworm mostly lies hidden under a large stone; and on turning such a stone over, one may sometimes find two or three of these lizards all coiled up together. But in the evening they leave their hiding-places, and go out to search for the tiny white slugs on which they feed.

When it is suddenly startled the blindworm sometimes behaves in a very odd way. It stiffens its body, gives a kind of shudder and a twist, and actually snaps off its own tail! Then the tail begins to writhe about on the ground, wriggling and curling and even leaping up into the air in the most curious manner; and while you are watching its antics, the blindworm creeps away into some place of safety. You would think that it must suffer a great deal of pain from this extraordinary injury, wouldn't you, and that the blindworm would feel it quite as much as a man would feel if his leg were cut off? But it does not seem to suffer at all; and stranger still, a new tail very

soon begins to grow in the place of the old one, so that in the course of a very few weeks the lizard is just as perfect as it was before!

SKINKS

These are queer little lizards with four short legs and very stumpy tails, which are found in many parts of Africa and Asia. They live in sandy deserts, and are rather slow in their movements as a rule. But if a fly should settle anywhere near them they will dart upon it with the most surprising quickness, and will hardly ever fail to capture it. And if they are alarmed they will burrow into the sand so rapidly that they really seem to sink into it just as if it were water. In a very few seconds, indeed, they will bury themselves to a depth of at least two or three feet.

In olden days skinks were very much used in medicine, and the powder obtained from their dried bodies was thought to be a certain cure for many diseases! It does not seem a very nice idea, yet even to this day skinks are used for the same purpose in Eastern countries.

There are several different kinds of these curious lizards, of which the common skink, found in Northern Africa, is the best known. It is about three inches and a half in length, and is yellowish brown in color, with a number of darker bands on the sides of the body.

GECKOS

Odder still are the geckos, which have their toes swollen out at the tips into round sucker-like pads, by means of which they can climb a wall or a pane of glass with the greatest ease, or even walk about like flies on the ceiling. They are very fond of getting into houses, generally remaining hidden in some dark corner during the day, but coming out toward evening to search for insects, and continually uttering their curious little cry of "geck-geck-geck-o."

People used to be very much afraid of geckos, some thinking

that they could squirt out poison from the pads of their toes which would act like the sting of a nettle, and others declaring that their teeth were so sharp and strong that they could pierce even a sheet of steel! But the real fact is that these lizards are perfectly harmless, and cannot injure any living creature except the insects upon which they feed. When they take up their quarters in a house they soon become extremely tame, and will even climb up on the dinner-table to be fed.

Geckos are found in almost all hot countries of the Old World, and nearly three hundred different kinds have been found altogether.

IGUANAS

American lizards are almost wholly members of the numerous iguana family, which takes its name from the big examples found from Mexico down into Brazil. The commonly known one when fully grown will measure four feet from the tip of its blunt, top-shaped head to the end of its long tapering tail. It looks rather forbidding, for a row of sharp spikes runs right along its back, while under its chin is a great dewlap. Yet it is not quite so terrible as it seems, for though it will bite fiercely if it is driven to bay, and use its long tail like the lash of a whip, it will always run away if it can, and will either climb into the topmost boughs of a tree, or plunge into a stream and swim away.

This reptile is a very good swimmer, driving itself rapidly through the water by waving its long tail from side to side, just like a crocodile or an alligator. And it can dive beneath the surface and remain at the bottom for a very long time without coming up to breathe.

Iguanas live chiefly among the branches of trees which overhang the water. Their flesh is very good to eat, for it is as tender as the breast of a young chicken. Their eggs, too, which they bury in the sand on the river-bank, are often used as food, and it is said that, no matter how long they may be boiled, they never become hard.

VARIOUS AMERICAN LIZARDS

The hot open plains which stretch from central Texas westward to the Pacific Ocean, and northward in Utah and Nevada, abound in a great variety of small lizards, none more than eighteen inches or so in length. Some are fat and short-tailed, some slender and swift, with tails like whiplashes. Some have gay colors and the power of changing them more or less, while others are dull of hue and uninteresting or repulsive to look at. Mostly they are insect-eaters, but some subsist upon plants; and one of the latter is the big fat one known in southern California as the "alderman."

Another strange one is the broad, flat creature so frequently seen all over the Southwest, and called horned toad, on account of its shape and habit of sitting on its squat legs, with its tail tucked sideways out of sight. It is covered almost all over with long and sharp spikes. Those on its head, which are directed backward, are the longest; and from these it gets its name of horned toad. But those on the back are very nearly as long, while there are several rows upon the tail as well. Yet it is perfectly harmless, for even when it is caught for the first time it never seems to use either its spikes or its teeth.

But it has another peculiarity which it sometimes uses as a means of defence, and that is a very strange one indeed. It actually squirts out little jets of blood from its eyes! That seems impossible, doesn't it? Yet there is no doubt at all about it, for when these lizards have been kept in captivity, and have been rather roughly handled, they have been known to squirt several drops of blood at a time to a distance of twelve or fifteen inches! Yet nobody seems to know how they do it.

THE GILA MONSTER

This same region, however, contains a poisonous lizard—the only kind of lizard in the world known to have sacs of venom in the mouth. This venom enters any wound made by the animal's biting with certain teeth, and acts upon the animal

bitten like snake-poison. This is a sluggish, round-headed, short-tailed creature which dwells in the sandy plains along the Mexican boundary, and is called the Gila monster, or, scientifically, the *Heloderma*. Its scales are rounded, so that this lizard looks as if dressed in pebbled goatskin; and its colors are black and yellow, in irregular blotches. The hunters and sheep-herders are more afraid of it than need be, for it is sleepy and will never use its poisonous teeth without great provocation, so that it is only necessary to leave it alone in order to escape any harm.

THE FRILLED LIZARD

This lizard is a native of Australia, and has round its neck a kind of frill, or ruff, from six to eight inches in diameter! As a rule this frill is folded round the throat, so that from a little distance one would scarcely notice it. But as soon as the reptile is excited or alarmed it spreads it out, sits on its hinder legs and its tail, raises its head and body, and shows its teeth, just as if it were going to fly at its enemy. This is only pretence, however, for though the lizard grows to a length of nearly three feet, it is quite harmless.

Another very curious habit which this lizard has is that of walking upright on its hind legs, in the attitude of a dog when "begging." It will even run in this position, and most odd it then looks. It is a capital climber, and spends most of its life in the trees, to which it always tries to escape when it thinks itself in danger. In color the frilled lizard is yellowish brown mottled with black.

THE CHAMELEON

Strangest of all strange lizards, however, is the chameleon. In the first place, this lizard has a very long tongue, which it can dart out to a really wonderful distance from its mouth. This tongue looks very much like a worm, and is exceedingly sticky, so that all that a chameleon has to do when it sees a fly settling near it is to dart out its tongue and touch it with the

tip. Then the fly adheres to it, and is carried back into the mouth so quickly that it is almost impossible to see what becomes of it. In this way it can catch a fly at a distance of fully six inches.

Then the chameleon has most extraordinary eyes. They are about as big as peas; but instead of having lids which move up and down, as ours do, they are entirely covered by the lids with the exception of just a tiny round space in the middle. The lizard sees, in fact, through a hole in the middle of its eyelid. That is strange enough; but what is stranger still is that the animal can move its eyes in different directions at the same time. They are hardly ever still for a single moment. But instead of moving together, like those of all other animals, one may be looking upward toward the sky and the other downward toward the ground; or the right eye may be peering forward in front of the nose while the left one is glancing backward toward the tail! Indeed, it would be very difficult to find an odder sight than that of a chameleon when it is moving its eyes about. They really look just as if they belonged to two different animals.

But the most wonderful fact of all about the chameleon is that it can change its color whenever it chooses.

How it does so no one quite knows. But the very same animal which is brown all over as it sits upon a branch will become green all over if you put it among leaves. The last thing at night, probably, you will find that it is gray. Next day, perhaps, brown spots will appear upon its body, and pinkish stripes upon its sides. And occasionally it may be violet, and sometimes yellow, and sometimes nearly black. So that if you were to go and look at a chameleon, and then go and look at it again half an hour afterward, you might very likely take it for a wholly different animal!

Then the chameleon has very odd habits. If it is annoyed, for example, it puffs out its body in the most extraordinary way till it is nearly double its ordinary size and its skin is stretched almost as tight as the parchment of a drum. When it is caught it hisses like a snake. And really it must be the very laziest creature on earth. If it lifts a foot into the air it will often wait for quite a minute before it puts it down again, and for

two or even three minutes more before it takes a second step. Then it always has to rest for some little time after uncoiling its tail from a branch, while when it coils it round another it stops and rests again. It will hardly travel two yards, in fact, in a day.

Chameleons are found in many parts of Africa and Asia, and also in Southeastern Europe.

CHAPTER XXVIII

SNAKES

THERE are a great many different kinds of snakes; but before we read about some of them, we must tell you something about the wonderful way in which their bodies are made.

In the first place, then, remember that snakes have a very large number of those sections or pieces forming the spine which we call *vertebræ*. We ourselves have only thirty-three of these little parts when we begin life, and twenty-six afterward; this difference in number being caused by the fact that five of the joints very soon unite into a bony mass at the lower end, which we call *sacrum*, while four more unite into another, which we call the *coccyx*. But some snakes have hundreds of these *vertebræ*. The boas, for example, have no less than three hundred and four!

In the next place, remember that all these *vertebræ* are fastened together by what we call ball-and-socket joints. That is, there is a round knob at the back of each vertebra which fits into a socket in front of the vertebra behind it. This gives to the spine of a snake great strength, for a vertebra cannot be forced out of its place without breaking the vertebra behind it. And it also allows the spine to be curled and twisted about in almost any direction; so that a snake can easily coil up its body like a spring, or even tie it into a knot.

Then, remember that a snake has a great many ribs. We have twelve pairs of these important bones, most of which are jointed to the breast-bone in front. But a snake may have as many as two hundred and fifty-two pairs of ribs, while it has no breast-bone at all; so that the tips of all the ribs are free. And every rib is fastened to a vertebra of the spine by a ball-and-socket joint, just like those which fasten the *vertebræ* themselves together. Besides this, there are no less than five separate sets of muscles connected with the ribs, so that the snake can move those bones about quite easily.

It is really by means of its ribs that a snake is able to glide over the ground. If you were to look at the under side of a snake's body, you would see that the scales are quite different from those on the upper part. On the back and sides the scales are quite small, and are almost oval, or oblong; but on the abdomen they are very long and very narrow, and are set crosswise like the laths of a Venetian blind.

Now the tips of every pair of ribs in a snake's body are fastened to one of these long abdominal scales in such a manner that when the snake moves the ribs forward the edge of the scale is raised—very much as you can raise the laths of the Venetian blind by pulling the cord at the side; and the snake travels by moving forward its ribs in turn, and catching hold of the ground with the edges of the scales, using first the ribs of one side and then of the other.

When a snake is crawling, however, it does not curve its body into upright loops as inaccurate pictures sometimes represent, but keeps it pressed flat upon the ground, so that the scales may be able easily to take hold of any little roughness upon the surface. And when it climbs a tree it does not twine its body round and round the trunk, but crawls straight up it, just as it crawls along the ground.

The mouth of a snake is very curiously made. We are not speaking now of the fangs of the poisonous serpents; we will tell you about these by and by. But remember that the mouth must be made in a very strange way, in order to allow these creatures to swallow their victims, which are often a good deal larger round than their own throats.

It sounds impossible, yet the snake can swallow an animal larger in diameter than its own throat, because the bones of its jaws, instead of being firmly fastened together as ours are, can be forced a long way apart, so as to make room for the carcass to pass.

Besides this, it has no less than six separate jaw-bones, four in the upper part of the mouth and two in the lower, every one of which is set with sharp, hooked teeth; and the points of these teeth are directed toward the throat. Now every one of these jaw-bones can be moved backward and forward at will. So

when a snake wishes to swallow the body of a victim, it first of all seizes it in its mouth, and then pushes one of the jaw-bones forward and takes a firm hold with the teeth. Then it pushes another forward, and then a third, and then a fourth; and so it goes on, each time taking a fresh hold with the hooked teeth, till at last the carcass is forced into the mouth. Then the bones separate, so as to make plenty of room for it to pass, and the alternate action of the jaws goes on as before till the carcass is forced into the throat. And then the flesh of the throat, which is very elastic, stretches out too, till before very long the carcass disappears altogether.

Then the eyes of snakes are made in a very curious way, for the eyelids, which are quite transparent, do not open and shut as ours do, but cover the eyes altogether. So a snake cannot blink; and it looks at you *through* its own eyelids, which are very much like little spectacle-glasses fastened into the skin!

When a snake throws off its skin, which it always does once in a year, and sometimes oftener, the eyelids are thrown off with it, and a pair of new ones are found lying below all ready to take their place. Just while this is happening (and it may take a day or two) the creature is trying to look through a double layer of eye-coverings, and can see very poorly until the outer one slips off. This is the explanation of the popular saying that snakes are blind in August (the usual skin-changing time).

HARMLESS SNAKES

All serpents may properly enough be divided into two sections—the non-poisonous ones, which are “harmless,” so far as their bite is concerned; and the poisonous ones, which inject a more or less deadly venom into wounds made by certain long weapon-teeth called fangs.

Let us consider first, for a moment, the harmless ones. The great majority of them—of the common snakes of the whole world—belong to a single family called colubers; and this family far outnumbered all other serpents. Most of its members are of small size; few exceed two yards in length, one of the exceptions being our handsome king-snake of Texas and westward,

which is a variety of the northern milk-snake. All are slender, agile, sometimes remarkably swift, with small heads, tapering and unarmed tails, and little or no means of defence, although some of them make such a show of fighting that they terrify many an enemy into leaving them alone.

To this great family belong our various blacksnakes, or blue racers, which occasionally are more than six feet long, and are among the worst robbers of birds' nests, eating both eggs and young, and the mother bird as well if it is small, and is not quick enough in seeking to escape. This is the snake about which stories of so-called *fascination* are told; we do not think there is much truth in them, but that the bird is simply reckless in her efforts to drive away the robber, and flies too near its darting jaws. The blacksnakes are exceedingly swift runners and agile climbers. Another excellent climber is the slender greensnake, which is so near the color of the leaves that it will not be noticed easily as it hangs in loops upon the branches of a bush, waiting quietly for some insect to come within reach. Most of our snakes, however, spend their time mainly on the ground, searching about the grass, among the tussocks of a swamp, or amid dense thickets, after frogs, toads, tadpoles, ground-nesting birds, mice, and especially insects, which last form the principal food of the smaller kinds. Among these probably the most often seen are the striped garter-snakes which abound in meadows and about haystacks and old barns, where they search holes and corners for mice and beetles. The warm, soft soil of old barnyards is a favorite place for the laying of their eggs by snakes, most of which bury them in such places and leave them to be hatched by the warmth of the sunshine. Nearly every pond, marsh, and slow stream abounds also in water-snakes, which are ugly in disposition as well as in color, and feed mainly on fishes, both dead and alive. Of this kind is the only snake to be found in England except the viper.

Perhaps the most curious of the colubrine snakes is the egg-eating snake of South Africa. It is quite a small snake, not more than two feet long, and scarcely thicker in body than a man's little finger; yet it will swallow pigeons' eggs quite easily, and, if it is very hungry indeed, will dispose of a hen's egg! This,

of course, is owing to the way in which the bones of the mouth are made. But if you were to watch one of these snakes as it was eating an egg, you would see a very strange thing happen. The egg would pass down the throat, and for a few inches you would be able to watch its outline as it moved along toward the stomach. Then, quite suddenly, the swelling would disappear! The fact is this. About thirty of the vertebræ have each a long, slender spine springing from the lower surface, and the tips of these spines pass through the upper part of the throat and project inside it, just like a row of little teeth in the wrong place. Just as the egg, while it is being swallowed, comes against these teeth, the snake contracts the muscles of its throat. The result is that the teeth pierce the egg from end to end and cut it in two. Then the contents flow onward down the throat, while the two halves of the shell, nearly always packed one inside the other, are shortly afterward spit out of the mouth.

PYTHONS

The pythons are very formidable snakes, not because they are venomous—for they have no poison-fangs—but owing to their immense size and strength. When fully grown they may measure as much as thirty feet in length, while their bodies are as big round as a man's thigh; and even when they are only half as long they are still most dangerous creatures, for they could crush a man to death in two or three minutes.

When a python attacks, it seizes its victim with its jaws, flings its coils one over another around it, and then squeezes so hard that in a very few minutes the bones fly into splinters, and the body is reduced to pulp. And a large python can swallow a half-grown sheep or a good-sized dog without any difficulty at all.

After the snake has swallowed its victim it becomes very drowsy, and often sleeps heavily for several days.

Another very curious fact with regard to the python is that it actually hatches its eggs by the warmth of its own body. It first collects the eggs into a little pile, and then coils itself round them, after which it remains perfectly still for nearly two months. During the whole of that time its bodily heat is

much greater than usual, and at last the egg-shells split, and out from each comes a baby python. A fortnight or so later they change their skins, and then are quite large and strong enough to kill and swallow small birds.

Pythons inhabit nearly all the hotter parts of Africa, Asia, and Australia, and are sometimes known as rock-snakes, on account of their living much in rocky places.

BOAS

The boas, one kind of which, the boa-constrictor, has long been famous among monsters, are much like the pythons, but are found only in tropical America and in Madagascar, and spend the greater part of their lives in the trees. They are quite as large as the pythons, and quite as formidable. It is said, indeed, that the anaconda, which is the largest of all, sometimes reaches a length of forty feet; and there is a stuffed skin, twenty-nine feet long, in the Natural History Museum at South Kensington, London. One can easily imagine what a terrible enemy such a snake as this would be, and how helpless even a strong man would find himself when wrapped in its mighty coils!

The anaconda is very fond of lying in the water with only just its head raised above the surface, and there waiting for some animal to swim within reach. But most of the boas lie in wait for their prey on one of the lower branches of a tree, in readiness to strike at any small creature that may pass beneath.

Some years ago a most singular accident happened in the reptile house at the London Zoo. Two boas, one eleven feet long and the other nine feet, were living in the same cage, and always seemed on the very best of terms. One night a couple of pigeons—one for each snake—were put into the cage, and the house was shut up as usual. Next morning, however, when the keeper opened it, the smaller snake had disappeared, and there was no hole in the cage through which it could possibly have escaped. At first the keeper was puzzled; but soon he noticed that the larger serpent was not coiled up as usual, but

was lying stretched out straight upon the ground. Then he understood what had happened. The big snake had swallowed the smaller one during the night, although it was only two feet shorter than itself!

Most likely both snakes had seized the same pigeon at the same moment. Before very long, of course, their jaws would have met in the middle. Now when one of these big snakes has once seized its victim it cannot let go, because of the way in which its jaws and teeth are made, but must go on trying to swallow it. So, you see, when the jaws of the two snakes met in the middle of the pigeon neither could give the bird up to the other, because neither could withdraw its teeth, and the larger one, in fact, could not help swallowing the smaller! And since that time two or three other accidents of the same character have been prevented only by the constant watchfulness of the keeper.

POISONOUS SNAKES

In all these reptiles the poison-fangs are two in number, and are situated in the upper jaw. They are very sharp indeed, and are almost as brittle as glass. So while they are not in use they are folded back out of harm's way upon the roof of the mouth. But if by chance they should be broken, there are three or four other pairs lying ready for use behind them which will quickly grow forward to take their place.

Generally there is a tiny hole just under the tip of the fang, which opens into a narrow passage running right through the center. But in some snakes there is only a groove outside the fang. In either case, however, the muscles which surround the poison-bag are arranged in such a way that as soon as the snake strikes its victim a drop of poison is squirted down each of the fangs, and so into the wound.

VIPERS

The only poisonous snake found in Europe is the viper, or adder. It is not by any means a large snake, for it is seldom

more than twelve or fourteen inches long. It has a zigzag chain of black, lozenge-shaped markings all the way along its back.

Vipers are generally found on heathy commons and moors, and are very fond of lying on a patch of bare, sandy ground, and enjoying the warmth of the sun. They never attempt to bite unless they are interfered with, but always try to crawl away, if alarmed, into a place of safety. Their poison is not strong enough to kill a man, unless he happens to be in a very bad state of health at the time when he is bitten; but it would be quite sufficient to cause the bitten limb to swell up to double its size, and to lead to a great deal of suffering and sickness.

COBRAS

Far more deadly is the bite of the cobra, which is found plentifully in India. Any one who is bitten by this formidable snake is almost sure to die within two or three hours.

The upper part of a cobra's neck is widened out into what is called the hood, which can be spread out or folded up at will by the action of the ribs. On the upper part of this hood is a dark **mark**, which looks almost exactly like a pair of spectacles. When a cobra is about to strike it always raises its head and neck and spreads this hood before darting at its foe.

In many parts of India cobras are caught and tamed by men who are called snake-charmers, and who sometimes capture them by playing an odd tune upon a sort of wooden pipe. This music seems to fascinate the snake, which comes out of its hole, rears up its head and neck, and begins to sway slowly from side to side. Then, still playing, the charmer moves his right hand very slowly indeed until it is just behind the snake's head, when he suddenly grasps the reptile round the neck. It is now, of course, quite helpless, and is quickly transferred to his bag.

Many charmers carry cobras about with them, which they handle quite freely. But in these cases the poison fangs have been carefully extracted, so as to render the reptiles harmless.

Cobras are very fond of eggs, and if they can find a rat-hole which opens into a hen-house they will often take advantage of it in order to rob the nests. But sometimes, when they have swallowed several eggs, and the hole happens to be a small one, they cannot crawl out again, and are found and killed when the house is opened in the morning.

THE PUFF-ADDER

Quite as deadly is the puff-adder, of Africa, which has a way of lying almost buried in the sand, so that it is not easily seen; and if it is disturbed it does not crawl away, as most poisonous snakes will do, but remains quite still, merely drawing back its head in order to strike. When fully grown it is about six feet long, and its poison is so deadly that even a horse has been known to die within two or three hours of being bitten.

This snake is called the puff-adder because it draws in a very deep breath when it is annoyed or irritated, and puffs out its whole body to nearly double its proper size. It then allows the air to escape gradually, with a kind of sighing noise, draws in another deep breath, and so on over and over again.

PIT-VIPERS

Australia, also, has some snakes whose bite is very deadly; and in general the tropics abound in these dangerous reptiles. This is as true of America as elsewhere, but all the American venomous serpents are of a kind peculiar to this continent, called pit-vipers. Some of them have rattles at the end of the tail and some lack this appendage, but all are much alike. Certain of the most dreaded, such as the fer-de-lance and the bushmaster, belong to the West Indies and Northern South America; but really the worst of the whole bad lot, because of its great size and sullen ferocity, is the huge diamondback rattlesnake of the Southern States. It is in some cases longer and heavier than any other known venomous snake; and its bite, if the wound is well poisoned, means almost immediate paralysis and death.

RATTLESNAKES

Several different species of rattlesnakes are scattered over the United States, and in some places, as on the hot dry plains of the Southwest, and in the arid mountains of Utah and California, are numerous enough to be troublesome. The cutting away of forests, draining of swamps, and cultivation of prairies, soon destroy these pests in thickly settled regions; but where rocky hills occur they linger for a long time, because the breaks and little caves among the ledges offer them secure retreats, winter homes where they sleep in safety, and proper nurseries for the young, which are not produced from eggs, as in the coluber family, but are born alive.

The rattles from which these serpents take their name, are a number of hollow, horny, button-like structures at the tip of the tail, which rattle together, with a peculiar humming sound, when the creature shakes its tail, as it is sure to do when disturbed or angry. It thus gives a warning to the man who might not have noticed the sluggish creature in his path in time to jump aside. Not all of the tribe have a rattle, however; and one of the reasons why our water-moccasin and copperhead are so much dreaded is that they possess no rattle, and therefore sound no "keep-off" warning.

All our American venomous snakes are too heavy and slow to climb trees. They get their prey—mice, gophers, snakes, etc.—by going to a place where it is likely to be running about, and then patiently waiting until something comes within striking distance.

CHAPTER XXIX

AMPHIBIANS

YOU will remember that the amphibians are distinguished from the true reptiles by having to pass through a tadpole stage before they obtain their perfect form. A good example is the frog, which in one kind or another exists in all parts of the earth except the very coldest. No doubt, you have often seen great masses of its jelly-like spawn floating on the surface of ponds early in the spring; and you must have wondered how such small creatures as frogs could possibly lay such enormous batches of eggs.

But the fact is that when these eggs are first laid they are very tiny. Each egg is only about as big as a small pin's head. Instead of having shells, however, they are covered with a very elastic skin, while at the same time they soak up water. So, as soon as they pass into the pond they begin to swell, and very soon each egg is as big as a good-sized pea.

TADPOLE AND FROG

In the middle of each egg is a round black spot, which increases in size every day. This is the future tadpole, and after a time the egg-skin splits, and out it tumbles into the water.

It is an odd-looking creature—just a big round head with a tiny pair of gills and a little wavy tail, and nothing else at all. But it manages to swim by wagging its tail, and it feeds on the tiny scraps of decaying matter which are always floating about in the water of the pond. Before long a little pair of legs begin to show themselves just at the base of the tail. A few days later another pair begin to grow in front of them. Then, by slow degrees, the tail passes back into the substance of the body, and so do the gills, while lungs are developed and nostrils are opened. And by the time that all these changes have taken place the tadpole has ceased to be a tadpole and has turned into a frog.

It leaves the water now and lives upon land, feeding upon small insects, which it catches in a most curious way. Its tongue is turned, as it were, the wrong way round; for the root is just inside the lips, while the tip is down the throat. Besides this, the tongue is very elastic and very sticky. So the animal catches its victims just as the chameleon does, flicking out its tongue at them and just touching them with the tip, to which they adhere. And as the tongue is drawn back into the mouth it pokes them down the throat; so that frogs do not even have to take the trouble of swallowing their dinner.

If you look at a frog's hind feet, you will notice that the toes are joined together by webbing. This allows them to be used in the water as well as upon dry land. It is generally said that frogs swim. But if you watch them in the water you will see at once that they do not really swim at all, but leap along, just as they leap along the ground. And each leap carries them through the water for some little distance.

TOADS

In some ways toads are like frogs; but you can tell them at once by their rough, dry skins, which are covered with warts like glands. And they crawl over the ground, instead of leaping as frogs do. They are very common almost everywhere, and you may often find them hiding under logs or large stones during the daytime.

Toads do not lay their eggs in great masses, as frogs do, but arrange them in strings about four feet long and an eighth of an inch wide. Each of these strings consists of two rows of eggs fastened side by side together. The tadpoles are very much like those of the frog, the chief difference being that they are rather smaller and blacker.

NEWTS

All through their lives newts keep their tails, instead of losing them when they cease to be tadpoles.

You can find newts in plenty all through spring and summer

by fishing with a small net in any weedy pond; but you will find that they are not all alike. Some have wavy crests running all along their backs; others have none; and some are brightly colored while others are plain olive green all over. Often in the woods in certain parts of the United States you will meet with little newts traveling about on the damp old leaves; and they are very conspicuous because of their brilliant vermilion color. These are young green newts which come out of the water, live ashore for a year or so in the red suit, and then go back to the water and a green coat.

Newts lay their eggs in a very curious manner. They do not fasten them together in great batches, like the frog, or in long, narrow strings, like the toad. They lay them one by one. And the mother newt takes each egg as she lays it, places it in the middle of the narrow leaf of some water-plant, and then twists the leaf neatly round it with her little fore feet, so as to wrap it up in a kind of parcel! The tadpole which hatches out of this egg is very much like that of a toad or a frog; but the front legs are the first to appear, instead of the hind legs, while the tail, of course, does not pass back into the substance of the body.

Newts swim with their tails, and very pretty and graceful they look as they move through the water. When they cease to be tadpoles, of course, they breathe air, just as toads and frogs do, and have to come up to the surface every two or three minutes to obtain it. And as long as they live in the pond they feed upon grubs and worms and tiny water-insects.

SALAMANDERS

The curious creatures known as salamanders are related to the newts, and begin their lives in just the same way. But after they have ceased to be tadpoles they only visit the water for two or three weeks in the spring.

The most celebrated member of this group is the spotted salamander, which is found in Central and Southern Europe, and also in Algeria and Syria. When fully grown it is about eight inches long, and may be known at once by the two rows

of large yellow blotches which run down from the back of its head, right along its body, to the very tip of its tail.

In days of old it was thought that the salamander had the power of walking through fire without being burnt! And it was also supposed, if it were attacked, to spring upon its enemy, bite out a piece of his flesh, and then spit fire into the wound! As a matter of fact it is almost harmless, and may be picked up and handled without the slightest danger. But the glands on its skin, like those on the toad's head and back, contain a rather poisonous fluid, which is squirted out if they are squeezed. So that if a dog were to pick up a salamander he would be quite sure to drop it again very quickly, and would most likely foam at the mouth for some little time.

Salamanders are very slow and timid creatures, and generally spend the whole of the day concealed in some crevice, or in the hollow trunk of a tree, or perhaps under a large stone. They feed upon slugs and small insects.

There are several kinds in North America, some of which, as the hellbender, are a foot or more in length.

The giant salamander, which is sometimes nearly a yard long, is found in the rivers of China and Japan, and spends the whole of its life in the water. It feeds chiefly upon fishes.

THE AXOLOTL

This is one of the most singular of all the amphibians. It is found in North America. Sometimes it develops into its perfect form, and sometimes it remains a tadpole all its life, and yet lays eggs just as though it were adult!

In the lakes of the southern Rocky Mountains the life of this creature is just like that of any other batrachian. That is, it is hatched out of the egg as a tadpole, grows first one pair of legs and then another, loses its gills by degrees, and at last appears in a lizard-like form, leaving the water and living upon dry land. But in the lake which surrounds the city of Mexico it never becomes anything more than a big tadpole, keeps its gills throughout its life, and does not leave the water at all.

THE OLM

The olm, or proteus, is found only in the underground lakes of Carniola and one or two other parts of Central Europe. It is about a foot long when fully grown, and has a slender, snake-like body, with a pair of tiny legs just behind the head, and another pair at the base of the tail. It is perfectly blind, the eyes being hidden under the skin, and yet cannot bear light. For if it is kept in captivity it will always hide in the darkest corner that it can find. And it has been known to live in confinement for five years without once taking any food.

What the habits of this extraordinary animal are in nature no one knows, as it has never been found except in these underground lakes.

In color the olm is pinkish gray, with bright-red gills, and there are from twenty-four to twenty-seven grooves upon either side of its body.

FISHES

CHAPTER XXX

FRESH-WATER FISHES

THE lowest class of the vertebrate animals consists of the fishes. These are easily distinguished. Some of the reptiles, it is true, are very fish-like. But then they have three chambers in their hearts, while the true fishes only have two. Then fishes never have limbs, the place of which is taken by fins; and further, they breathe water by means of gills. There are other differences as well; but these are quite sufficient to show us that reptiles and fishes cannot possibly be mistaken for one another.

Between the two, however, come several very curious creatures, which seem to be partly reptiles and partly fishes; for they have four slender members which hardly seem to be legs, though they cannot possibly be described as fins, while they possess not only gills but lungs as well.

THE MUD-FISH

One of these is the odd mud-fish of the African rivers. In general appearance this animal looks something like an eel, and it grows to a length of about three feet. Its four long ray-like limbs seem to be quite useless to it, and it swims by means of its tail, along the upper part of which runs a narrow fin. It is a creature of prey, feeding upon other fishes, and when food is plentiful, it just takes one bite out of the lower part of their bodies and no more.

In summer the rivers in which it lives often dry up altogether, and the mud at the bottom is baked as hard as a brick by the rays of the sun. So, as soon as the water begins to get shallow,



NORTH AMERICAN FOOD AND GAME FISHES

the animal burrows deep down into the mud, curls itself up like a fried whiting, and falls fast asleep for several months, just as hedgehogs and dormice do during the winter in cold countries. Then, when the rainy season comes and the rivers fill up again, it comes out from its retreat and swims about as before. It is from this habit that it gets its name of mud-fish.

Now we come to the true fishes; and perhaps our best plan will be to read about some of the fresh-water fishes first, and afterward about some of those which live in the sea.

STICKLEBACKS

Let us begin with a little fish which is very common in almost every pond, but is nevertheless very curious and very interesting. When fully grown, the stickleback is about three inches long, and you can tell it at once by the sharp spines on its back, which it can raise and lower at will. It uses these spines in fighting. For the male sticklebacks, at any rate, are most quarrelsome little creatures, and for several weeks during the early part of the summer they are constantly engaged in battle.

At this season of the year they are really beautiful little fishes, for the upper parts of their bodies are bright blue and the lower part rich crimson, while their heads become pale drab, and their eyes bright green! And apparently they are very jealous of one another, for two male sticklebacks in their summer dress never seem able to meet without fighting. Raising their spines, they dash at one another over and over again with the utmost fury, each doing his best to swim underneath the other and cut his body open. When one of them is beaten he evidently feels quite ashamed of himself, for he goes and hides in some dark corner where nobody can see him. And, strange to say, as soon as he loses the battle his beautiful colors begin to fade, and in a very few hours they disappear altogether.

About the beginning of June, all the male sticklebacks which have not been beaten set to work to build nests. These nests are shaped like little tubs with no tops or bottoms, and they are made of tiny scraps of grass and cut reed and dead leaf, neatly woven together. As soon as they are finished the female stickle-

backs lay their eggs in them. Then the males get inside, and watch over the eggs until they hatch.

PERCHES

Another very handsome fresh-water fish is the perch, which is plentiful in almost every river and lake in the warmer parts of the whole world. In color it is rich greenish brown above and yellowish white below, with from five to seven upright dark bands on either side of its body, while the upper fins are brown and the lower ones and the tail bright red.

The front fin on the back of the perch, which can be raised or lowered at will, is really a very formidable weapon, for it consists of a row of very sharp spines projecting for some little distance beyond the membrane which joins them together. Even the pike is afraid of these spines, and it is said that although he will seize any other fresh-water fish without a moment's hesitation, he will never venture to attack a perch.

Early in the month of May the mother perch lays her eggs, which she fastens in long bands to the leaves of water-plants. Their number is very great, over 280,000 having been taken from quite a small perch of only about half a pound in weight!

The climbing perch of India, notwithstanding its name, is not a true perch, but belongs to quite a different family. It is famous for its power of leaving the water and traveling for a considerable distance over dry land. It does this in the hot season if the stream in which it is living dries up; and if you were to live in certain parts of India you might perhaps meet quite a number of these fishes shuffling across the road by means of their lower fins, and making their way as fast as possible toward the nearest river!

But how do they manage to remain out of the water for so long?

Well, the fact is that fishes can live for a long time out of the water if their gills are kept moist. In some fishes, such as the herring, this is not possible, because their gills are made in such a way that they become dry almost immediately. But the climbing perch has a kind of cistern in its head, just above the

gill-chambers, which contains quite a quantity of water. And while the fish is traveling over land this water passes down, drop by drop, to the gills, and keeps them constantly damp.

When this fish has been kept in an earthenware vessel, without any water at all, it has been known to live for nearly a week!

THE CARP

Another fish which will live for quite a long time out of the water is the carp, which has often been conveyed for long distances packed in wet moss.

This fine fish is a native of the Old World, where it is found both in rivers and lakes, but prefers still waters with a soft muddy bottom, in which it can grovel with its snout in search of food. During the winter, too, it often buries itself completely in the mud, and there hibernates, remaining perfectly torpid until the return of warmer weather. It is not at all an easy fish to catch, for it is so wary that it will refuse to touch any bait in which it thinks that a hook may be concealed. And if the stream in which it is living is dragged with a net, it just burrows down into the mud at the bottom and allows the net to pass over it.

Owing to this crafty and cunning nature, the carp has often been called the fresh-water fox.

The carp is a very handsome fish, being olive brown above, with a tinge of gold, while the lower parts are yellowish white. It sometimes weighs as much as twenty-five pounds, and has been known to lay more than 700,000 eggs! It is domesticated in many parts of North America and other countries.

THE BARBEL

Found in many Old World rivers, the barbel may be known at once by the four long fleshy organs which hang down from the nose and the corners of the mouth. These organs are called barbules, and may possibly be of some help to the fish when it is grubbing in the soft mud in search of the small creatures upon which it feeds. It spends hours in doing this, and a hungry barbel is sometimes so much occupied in its task that a swimmer

has dived down to the bottom of the river and caught it with his hands. From this curious way of feeding, and its great greediness, the barbel has sometimes been called the fresh-water pig.

In color this fish is greenish brown above, yellowish green on the sides of the body, and white underneath. When fully grown it weighs from ten to twelve pounds.

THE ROACH

This is one of the prettiest of the European fresh-water fishes, which is found in many lakes and streams. The upper part of the head and back are grayish green, with a kind of blue gloss, which gradually becomes paler on the sides till it passes into the silvery white of the lower surface. The fins and the tail are bright red.

The roach does not grow to a very great size, for it seldom weighs more than two pounds. It lives in large shoals, and in clear water several hundred may often be seen swimming about together.

THE PIKE

One of the largest and quite the fiercest of the British fresh-water fishes is the pike, which is found both in lakes and rivers. In America we have no pike proper, but in some of the great western lakes a very large relative of similar habits known as the maskinonge; and our pickerels are only small pikes. Wonderful tales are told of the ferocity of the pike. He does not seem to know what fear is, and his muscular power is so great, and the rows of teeth with which his jaws are furnished are so sharp and strong, that he is really a most formidable foe. All other fresh-water fishes are afraid of him, while he gobbles up water-birds of all kinds, and water-mice, and frogs, and even worms and insects. And no matter how much food he eats, he never seems to be satisfied.

When the pike is hungry, he generally hides under an overhanging bank, or among weeds, and there waits for his victims to pass by.

The young pike is generally known as the jack, and when only five inches long has been known to catch and devour a gudgeon almost as big as itself. With such a voracious appetite, it is not surprising that the fish grows very fast, and for a long time it increases in weight at the rate of about four pounds in every year. How long it continues to grow nobody quite knows; but pike of thirty-five or forty pounds have often been taken, and there have been records of examples even larger still.

In color the pike is olive brown, marked with green and yellow.

TROUT

Perhaps the greatest favorite of all anglers is the trout, which, in one or more of its various species, is to be caught in almost every swift stream and highland lake throughout the temperate zone, except where the race has been destroyed by too persistent fishing. This happens everywhere near civilization, unless protective laws regulate the times and places where fishing may be done. Similar laws are required to save many other kinds of fishes from quick destruction at the hands of the thoughtless and selfish, and they should be honestly obeyed and supported in spite of their occasionally interfering with amusement.

Trout are graceful in form and richly colored, most of them having arrangements of bright spots and gaily tinted fins. The common trouts of Europe and the eastern half of the United States and Canada are much alike; but in the Rocky and other mountains of the western shore of our continent others quite different are scattered from the Plains to the Pacific. One of the most interesting and beautiful of these, the rainbow-trout, has been brought into the East, and has made itself at home in many lakes and rivers of the Northern States and Canada.

The trout is an extremely active fish, and when it is hooked it tries its very hardest to break away, dashing to and fro, leaping, twisting, and fighting, and often giving the angler a great deal of trouble before he can bring it in. In small streams it seldom grows to any great size, but in some of the Scottish lochs and lakes of Maine trout weighing fifteen or even twenty pounds are

often taken. It is sometimes considered, however, that these belong to a different species.

THE SALMON

More famous even than the trout is the salmon, the largest and finest of all our fresh-water fishes, which often reaches a weight of forty-five or fifty pounds, and sometimes grows to still greater size.

It is hardly correct, however, to speak of it as a fresh-water fish, for although salmon are nearly always caught in rivers, they spend a considerable part of their lives in the sea.

Salmon are of two kinds— the Atlantic and the Pacific species; and the life-history of each is a very curious one.

During the winter the parent fishes of the Atlantic salmon, which used to be exceedingly numerous in all our northern rivers emptying into the Atlantic, and still haunt the rivers of Northeastern Canada, and of Scotland, make their way as far up a clear and gravelly river as they possibly can, till they find a suitable place in which to lay their eggs. The mother then scoops a hole at the bottom of the stream, in which she deposits her eggs in batches, carefully covering up each batch as she does so. At this time both parents are in very poor condition, and the males are known to anglers as "kelts." For a time they remain in the river, feeding ravenously. Then in March or April they travel down the river and pass into the sea, where they stay for three or four months, after which they ascend the river again, as before.

Meanwhile the eggs remain buried in the gravel for about four months. At the end of that time the little fishes hatch out, and immediately hide themselves for about a fortnight under a rock or a large stone. You would never know what they were if you were to see them, for they look much more like tadpoles than fishes; and each has a little bag of nourishment underneath its body on which it lives. When this is exhausted they leave their retreat and feed upon small insects, growing very rapidly, until in about a month's time they are four inches long. They are now called parr and have a row of dark stripes upon

their sides, and in this condition they remain for at least a year. Their color then changes, the stripes disappearing, and the whole body becoming covered with bright silvery scales.

The little fishes are now known as smolts, and, like their parents, they make their way down the river and pass into the sea. There they remain until the autumn, when they ascend the river again. By this time they have grown considerably, weighing perhaps five or six pounds, and are called grilse. And it is not until they have visited the sea again in the following year that they are termed salmon.

When salmon are ascending a river and come to a water-fall, they climb it by leaping into the air and so springing into the stream above the fall, trying over and over again until they succeed. When the fall is too high to be climbed in this way, the owners of the river often make a kind of water staircase by the side of it, so that the fishes can leap up one stair at a time. This is called a salmon-ladder.

NORTH PACIFIC SALMON

Now this description would not at all fit the case of the salmon which live in the North Pacific and ascend the rivers of California, British Columbia, and Alaska, and of Siberia and Japan on the other side of the ocean. These are the salmon which supply the whole country, and many other countries, with their pink flesh, boiled, and sealed in cans, so that it may be sent long distances and kept many months without spoiling. Every spring and summer, at different times according to the locality and the species—there are five kinds of importance, caught for the trade—vast numbers of them enter the mouths of the rivers and begin to make their way up-stream in their effort to reach the shallow head waters of each river, and of every one of its tributaries. It is at this time that they are caught by spearing, netting, and various contrivances; but laws prevent any general obstruction which would altogether stop the advance of the host, so that while tens of thousands are taken great numbers escape and pass on, as it is necessary they should do in order to lay eggs and so keep up the race.

This takes place far up at the heads of the streams in the foothills of the mountains; and having deposited the spawn, late in summer, the spent fish begin to drift down stream again. But all this time they have been eating nothing, they are worn with the long struggle against the rapids, often wounded by sharp rocks, and are good for nothing to catch or eat. In fact, so fagged out and weak are they that all of them die before any reach the mouth of the river. It is a strange fact that of all the vast host of salmon which each summer climb the rivers not a single one gets back to the sea.

A year later, however, the young hatched from the eggs which were left behind them at the heads of the streams swim down the rivers and enter the ocean. There they remain, probably not very far from land, for two or three years, feeding and growing until they are of full size and strength; and each season a class of them, having reached the right age and condition to spawn, force their way up to the spawning-grounds, to leave their eggs and then die, as did their parents before them.

EELS

The only other fresh-water fishes which we can notice are the eels, which look more like snakes than fishes, for they have long slender bodies, with a pair of tiny fins just behind the head, a long one running along the back and tail, like a crest, and another, equally long, under the body. And they are clothed with a smooth, slimy skin instead of with scales.

These curious creatures live in ponds and even in ditches as well as in rivers, and are very plentiful in all parts of the northern hemisphere. During the daytime, although they will sometimes bask at the surface in the warm sunshine, they generally lie buried in the mud at the bottom of the water, coming out soon after sunset to feed. And when the weather is damp, so that their gills are kept moist as they wriggle through the herbage, they will often leave the water and travel for some little distance overland.

They frequently do this when they are traveling toward the

sea. For it is a strange fact that, although they are fresh-water fishes, eels both begin and end their lives in the sea.

In the first place, the eggs are laid in the sea—generally quite close to the mouth of a river. When the little elvers, as the young eels are called, hatch out, they make their way up the river in immense shoals. In the English river Severn, for instance, several tons of elvers are often caught in a single day; and about thirty million elvers go to the ton! After being pressed into cakes and fried, these little creatures are used for food; but they are so rich that one cannot eat very many at once.

When they have traveled far enough up the river, most of the elvers which have escaped capture make their way to different streams and pools and ditches, and there remain until their growth is completed. They then begin to journey back to the sea, and when they reach it they lay eggs in their turn. After this, apparently, they die.

In the rivers of South America a most wonderful eel is found which has the power of killing its victims by means of an electric shock, wherefore it is called the electric eel. The electricity is produced and stored up in two large organs inside the body, but how it is discharged nobody knows. If the fish is touched it merely gives a slight shudder. But the shock is so severe that quite a large fish can be killed by it, while a man's arm would be numbed for a moment right up to the shoulder.

LAMPREYS

The lamprey, which is found plentifully in many northern rivers, is very much like an eel in appearance. But it has no side fins, and instead of possessing jaws, it has a round mouth used for sucking, and resembling that of a leech; and on either side of its neck it has a row of seven round holes, through which water passes to the breathing-organs.

Lampreys seem to spend the greater part of their lives in the sea, but always come up the rivers to spawn. They lay their eggs in a hollow in the bed of the stream, which they make by dragging away stone after stone till the hole is sufficiently deep.

Very often a large number of lampreys combine for this purpose, and make quite a big hole, in which they all lay their eggs together.

The length of the lamprey is generally from fifteen to eighteen inches, and its color is olive brown.

CHAPTER XXXI

SALT-WATER FISHES

WE now come to the fishes of the sea; and at the head of these we may place the sharks.

These savage and voracious creatures are found in all oceans, the larger ones wandering very widely, while the smaller ones are restricted to limited parts of the sea. Among the latter are the various small sharks called dogfish, from eighteen inches to six feet long, found on both sides of the North Atlantic. Though small, and harmless to man, the dogfish really is a shark, and for its size is very formidable, being able easily to fight and kill fishes quite as large as itself.

It is called the dogfish because it follows shoals of fish in the water, just as a wild dog will follow the animals on which it preys upon dry land.

When you are staying at the seaside you may sometimes find the dead body of a dogfish lying on the beach, where it has been flung by a very high wave. And you will notice how coarse and rough its skin is. This skin is often used for covering the handles of swords, as it gives such an excellent grip; and also for putting on the sides of match-boxes instead of sandpaper.

But even if you do not find the dogfish itself lying on the beach, you may often find its eggs, which are very curious little objects. They are something like oblong horny purses, of a yellowish-brown color, with a long twisted appendage at each corner, very much like the tendrils of a vine. By means of these the egg is anchored down to the weeds at the bottom of the sea, and they hold so firmly that they are hardly ever torn away, except during a violent storm.

At each end of this singular egg is a narrow slit, through which water can pass to the gills of the little fish which is lying inside it. And one end of the egg is made in such a manner that when the fish is ready to hatch it can easily push its way out.

THE BLUE SHARK

A much larger and more dangerous fish, which often visits northern seas, is the blue shark, which sometimes grows to a length of fifteen or sixteen feet. It does not often attack human beings, however, but is very destructive in our fisheries, snatching away fishes which have been hooked, and even swimming along the outside of the nets as they are being drawn in, and biting great holes through them, in order to get at the pilchards or herrings within. So the fishermen always kill a blue shark if they have the chance of doing so, and sometimes destroy eight or ten in a single day.

But it is not very easily caught, for if it is hooked it will often bite the line asunder, and if it cannot do this will roll round and round in the water coiling the line round its body, when it will snap with a sudden jerk. Even when it is caught, the blue shark is not killed without much difficulty, for it thrashes its great powerful tail about in such a manner that it cannot be approached without danger. So the first thing that the fishermen always try to do when it is captured is to chop off its tail with an ax.

The color of this shark is slaty blue above and white beneath.

THE WHITE SHARK

Even larger and more dangerous still, the great white shark, or Rondeleti's shark, is one of the most formidable creatures that roam the seas. It often grows to a length of thirty-five or even forty feet, and weighs ten or twelve tons, while one snap of its huge jaws will shear off a man's legs or cut his body in two.

This enormous fish is found in all the warmer parts of the sea; and in general sharks, and especially the large ones, belong to the tropical rather than to the colder seas.

THE HAMMERHEAD

A huge and much-to-be-dreaded creature, of curious appearance, this fish has its head formed just like that of a hammer, the

eyes being placed at each end of the projecting lobes. It grows to a length of fifteen or sixteen feet, and is very fierce and savage, attacking human beings without the least hesitation. It is nearly always found in the tropical seas, but has been several times captured off the coasts of New England.

THE THRESHER

Growing to a length of ten or twelve feet, the thresher is a remarkable shark. It is common in the Mediterranean Sea and the Atlantic Ocean. It feeds chiefly upon herrings, darting into the midst of a shoal and snapping them up in hundreds.

What it is specially famous for, however, is its habit of attacking whales. For this purpose several threshers will unite together, leap up into the air, and strike tremendous blows with their long tails upon the whale's body as they fall back into the sea. This naturally terrifies the whale, and he dives under water in order to escape from his tormentors. Knowing that he must very soon rise again, however, they wait for his reappearance, and then attack him again in the same way. This happens again and again, until he is quite worn out by his exertions, and by the impossibility of remaining long enough at the surface to breathe properly. Then if any swordfishes happen to be in the neighborhood, they come and attack him too, driving their long swords deep into his body. Before long the whale is dead, and both threshers and swordfishes are tearing great strips of flesh from the carcass and greedily devouring them.

SAW-FISHES

Next to the sharks come the saw-fishes, which have the upper jaw drawn out into the form of a long, narrow beak, set on either side with a row of large, pointed teeth. So it really looks very much indeed like a saw. The fish uses this curious weapon by dashing into the midst of a shoal of smaller fishes and striking them right and left with its saw. In this way it is sure to disable a good many, which it then swallows leisurely one after the other.

Saw-fishes are found in all the warmer seas, and sometimes grow to a length of fifteen or twenty feet.

RAYS

The rays have broad flattened bodies, and very long and slender tails. In consequence of this structure they cannot swim by means of their tails, as nearly all other fishes do, but travel slowly through the water by waving their side fins, after the manner of soles and flounders.

One of the best known of these fishes is the skate, which when fully grown sometimes measures as much as six feet in length from the snout to the tip of the tail, and five feet in width of body. As it cannot swim fast enough to overtake other fishes, it preys chiefly upon crabs, lobsters, and shell-bearing mollusks, which it finds on the bottom and is able easily to crunch up, shells and all.

The eggs of this fish may be found in great numbers on the sea-shore. They are very much like those of the dogfish, but are nearly black in color, and instead of a long twisted tendril at each corner, they only have a blunt projection about an inch long. They remind one, in fact, of a hand-barrow, and consequently the fishermen often call them "skate-barrows."

In color, the skate is grayish brown above and grayish white beneath.

Another very curious ray is the torpedo, which is an electric fish, having a kind of electric battery inside its body, from which a very powerful shock can be discharged at will. This battery, in appearance, is something like a honeycomb, consisting of a number of six-sided columns, which run from the skin of the back to that of the lower surface of the body. Each of these columns is divided into a number of cells, or chambers, by thin walls of membrane; and each cell contains a liquid which seems to consist chiefly of salt and water.

The electricity produced and stored up in these organs seems to be discharged along four great nerves, which run from the battery up to the brain. The shock is sufficiently strong to kill a duck; and not only has an electric bell been rung by it, but an

electric spark has been actually obtained. And when five persons held one another's hands, and the person at each end laid his finger upon the torpedo, every one of the five persons felt the shock.

Even more formidable, though in quite a different way, is the sting-ray. At the base of its long whip-like tail this fish has a bony spine set with sharp teeth, like a saw; and its favorite mode of attack is to coil this tail round the body of its victim and then to drive the spine into his flesh, working it backward and forward in such a manner as to cause a very serious wound always followed by severe inflammation.

Some of the rays in the warmer seas grow to a very great size; indeed, a ray measuring over eighteen feet in length has more than once been captured. They are dangerous creatures to meddle with, for a fish of this size is quite strong enough to overturn a boat, while if a man were once seized by one of them, he would have very little chance of escape.

These huge creatures are generally known as devil-fish.

THE STURGEON

This fish belongs to quite a different group, which may be distinguished by two points. In the first place, its skeleton is made not of bone, but of gristle; and in the second place, five rows of shield-like bony plates run along the back and sides of the body, forming a kind of natural armor.

The sturgeon is often eight or nine feet long, and weighs three or four hundred pounds. It spends most of its life in the sea, but ascends the rivers in order to spawn, like the salmon. It is not so common as formerly in American waters, although sturgeon are taken in nearly all our larger rivers from time to time; but in some parts of Europe, and especially in Russia, it is very plentiful.

Caviare is made from the sturgeon's roe. The membranes which separate the eggs from one another are all removed, and the eggs are then salted and pressed into small barrels, being afterward eaten as a kind of preserve.

The best isinglass is made from the sturgeon's swimming-

bladder, which has so much gelatine in it that, if a small quantity is dissolved in a hundred times as much boiling water, it will form a stiff jelly when it is cold.

The sturgeon's flesh is very good to eat, for it is not only well-flavored, but is so firm and solid that it is almost like beef.

In England the sturgeon is known as a "royal" fish, because, in days of old, when one of these fish was caught in an English river, it was always kept for the table of the king; and even now, if a sturgeon is captured in that part of the Thames which is under the control of the Lord Mayor of London, it belongs by right to the Crown.

THE BEAKED CHÆTODON

A great many fishes are very odd to look at, and this is one of the oddest. Imagine a fish with an almost circular flattened body, with five brown bands edged with white running round it, huge round eyes, enormous triangular fins both above and below the body, a broad tail, which looks as if it were tied in by a piece of ribbon at the base, and a mouth drawn out into a long slender beak! And this fish has a habit which is even odder still, for when it sees an insect sitting on a leaf which overhangs the margin of the sea, it takes careful aim, squirts a drop of water at it from out of its long beak, and nearly always succeeds in knocking it into the water below!

This fish lives in the Indian and Polynesian seas, and is sometimes kept as a pet by the Japanese, who amuse themselves by fastening a fly to the end of a piece of stick and holding it over the bowl in which the fish is living, in order to see it knocked off its perch by a pellet of water.

THE COD

Throughout the northern seas the cod is found, and in some parts it is taken in immense numbers. The largest and finest of all, which sometimes weigh more than one hundred pounds, come from the banks, or shallows in the sea, off the shores of Newfoundland, but very fine ones have been taken elsewhere;

and extensive cod-fisheries are maintained in the North Pacific, near Alaska.

Cod are mostly captured by means of long lines, each about forty fathoms in length, to which a number of smaller lines are fastened at intervals. The hooks are placed on the side lines, and are generally baited with whelks, and then the long lines, or trawls, as the fishermen call them, are anchored in shallow parts of the sea where codfishes, halibut, and the like abound. Each boat carries about eight miles of these lines, with nearly five thousand hooks, so that the work of baiting, lowering, and raising them is very heavy indeed. The fishing takes place in the winter, and the boats are generally out in all weathers for several months at a time.

One would think that with so many boats engaged in cod-fishing, each with so many miles of line, nearly all the cod in the sea would soon be caught. But to offset this, a single cod in a single year will often lay eight or nine million eggs, so that notwithstanding the immense number of these fishes which are taken, they still seem as plentiful as ever.

FLATFISH

The so-called flatfishes, such as the sole, the plaice, the flounder, and the dab, form an interesting group. Although we call them "flat," we ought really to call them "thin," because what we always consider as the back of a sole is really one of its sides, and what seems to be the lower surface is the other side.

The explanation is this: when these fishes are quite small, they swim upright in the water, just as other fishes do, and drive themselves along by means of their tails. But when they are about a month old a strong desire comes over them to go and lie down on the mud at the bottom of the sea, and then three remarkable things happen.

First their color changes. Up till now, both sides of their bodies have been nearly white. But if a white fish were to lie down on dark-brown mud, of course it would very easily be seen, and most likely would very soon be devoured by one of its many

enemies. So as soon as the little fish lies down at the bottom of the water its upper surface begins to grow darker, and before very long it exactly resembles the hue of the surrounding mud. Or if the fish should lie upon sand, as the plaice does, then its upper surface becomes colored like the sand. So as long as it keeps still its enemies may pass quite close to it without noticing it.

The next thing that happens is that the little fish changes its way of swimming. Hitherto it has driven itself through the water by means of its tail; now it uses what were formerly its upper and lower fins, but have now been turned into side fins. And by a very graceful waving movement of these fins it winds its way, as it were, through the water.

But the third change is the strangest of the three. One of the eyes would now seem to be useless, since it is on the lower surface of the head as the fish lies on the sea-bottom, and would be completely buried in the mud. But as soon as the fish goes and lies down at the bottom of the sea, this eye actually begins to travel along the lower surface of the head, till at last it works its way round and settles down by the side of the other!

If you look at the flounders the next time you pass by a fish-market, you will observe that both eyes are placed quite close together above the same corner of the mouth. That is because the lower eye traveled round the head till it found a resting-place by the side of the other.

In habits, all these fishes are very much alike. They are found in almost all seas, except those of the polar regions, and in most parts of the world are exceedingly plentiful, and everywhere form a cheap and excellent food.

THE SWORDFISH

A very odd-looking creature is this. It abounds in the Atlantic and also in the Mediterranean. Its chase affords one of the finest summer sports to be enjoyed along the south coast of New England, where it is taken by spearing from swift sailboats.

In this fish the upper jaw, which has hardly any teeth in it, is drawn out into a long, slender, pointed beak. With this "sword"

the fish impales its victims, which are often of considerable size; but how it gets them off its beak again in order to eat them nobody seems to know.

This fish sometimes drives its way through the water with such tremendous force that it has been known to pierce the planking of a boat with its sword, which it had to snap short off in order to release itself.

In the Natural History Museum at South Kensington, London, there is part of a beam taken from the hull of a ship, into which one of these fishes had driven its sword to a depth of twenty-two inches.

MACKEREL

One of the best known of all the salt-water fishes is the mackerel. This fish lives in enormous shoals, which are always traveling from place to place, and visit the same parts of our coasts at about the same season in every year. Sometimes they are caught in most extraordinary numbers, so that they can be purchased at very small prices. In some cases, indeed, the catch has been so heavy that it has been found quite impossible to draw in the nets, which had to be allowed to sink to the bottom with the fishes still in them.

These nets are generally made with rather large meshes, not quite wide enough to allow the fishes to swim through. When the mackerel are caught they try to force their way through the meshes, but find that they cannot do so. They then attempt to back out. In doing this, however, the thin twine of which the net is made is almost sure to become entangled with their gill-covers, so that they are held prisoners until the net is lifted from the water.

When fully grown the mackerel is about sixteen inches long, and weighs perhaps two pounds.

SUCKING-FISHES

Of the sucking-fishes, or remoras, there are about a dozen different kinds, distinguished by the odd sucker-like disk on the

upper part of the head, by means of which they can attach themselves firmly to any object to which they wish to cling. They often fasten themselves in this manner to the hulls of ships, and also to the bodies of sharks and the shells of turtles, and so are carried for long distances without any exertion of their own.

So firmly do these odd little fishes cling, that it is most difficult to remove them without injuring them, and the sharks and turtles have no means of forcing them to loose their hold.

It is a very odd fact that the coloring of the sucking-fishes is just the opposite of that which we find in almost all other fishes. Instead of the upper surface being dark it is light, and instead of the lower surface being light it is dark. But when one of these fishes is clinging to a shark it is the lower surface which is seen, not the upper one; for *that* is pressed against the body of the shark; and in order to prevent its enemies from seeing and eating it, the lower parts of its body are colored just like the skin of the shark.

WEEVERS

Strange little fishes are the weevers, two kinds of which are found on the coast of Europe.

Both are highly poisonous, a prick from the spines of the upper fin or the gill-cover being almost as serious as the sting of a scorpion. The poison lies in a deep double groove on each spine, and as the fishes have a habit of burying themselves in the sand at the bottom of shallow water, with only just the sharp spines projecting, they are rather apt to be trodden upon by bathers.

Accordingly, when a fisherman catches a weever-fish he always cuts off its back fin and the spines of its gill-covers at once; while in France and Spain he is compelled to do so by law.

THE ANGLER

The angler, or all-mouth, is the name of a hideous creature—about five feet long when fully grown—with a huge mouth, a great broad body shaped very much like that of a seal, two big round eyes which look almost straight up into the water above,

and a row of long, slender spines on the back instead of the usual fins. The first of these spines has a broad, tufted, glittering tip, used for a most singular purpose.

It is a creature of prey, feeding entirely upon other fishes; and it has a most enormous appetite, which is hardly ever satisfied. But, at the same time, it is so slow in its movements that if it were to try to chase its victims it would never get anything to eat. It seems to know perfectly well, however, that fishes are very inquisitive creatures, and that they are always greatly attracted by any object that glitters. So when it feels hungry it lies down at the bottom of the sea, stirs the mud gently up with its side fins, so as to conceal itself from view, and dangles the glittering spine up and down in front of its open mouth. Before very long some passing fish is sure to come swimming up to see what this strange object can possibly be; and then the angler just gives one snap with its great jaws, and that fish is seen no more.

Just to show you how successful it is in its fishing, we may tell you that from the body of a single angler no less than seventy-five herrings have been taken, while another had swallowed twenty-five flounders and a John-dory!

There is another kind of angler which lives down at the bottom of the deep sea, where it is always perfectly dark. There, of course, a glittering spine would be useless, for the other fishes would not be able to see it. So this angler has a spine which shines at the tip like a firefly, so that it can be seen from a considerable distance as the fish dangles it up and down!

GURNARDS

These, too, are remarkable fishes, having square heads, which look ever so much too big for their bodies, and the first three rays of their pectoral or breast fins made like fingers. These breast-fins are used like fingers, too, for they serve as organs of touch, while the fish also walks with them along the sand at the bottom of the sea.

At least forty different kinds of gurnards have been discovered, but nearly all dwell along foreign coasts. The handsomest of these, perhaps, is the red gurnard, which grows to a length of

twelve or fourteen inches, and is bright red above and silvery white below.

FLYING FISHES

Though objects of never-ending interest to every one who journeys through the warmer seas, flying fishes do not really fly. They merely skim for long distances through the air, just as the flying squirrel and the flying dragon do; but instead of having a broad parachute-like membrane to buoy them up, they are supported in the air by the pectoral or breast fins, which are very large. These fins do not beat the air, like the wings of a bird. They merely support the body. And the power of the so-called flight is due to a stroke of the tail just as the fish leaves the water.

The reason why these fishes take their long leaps through the air appears to be that they are much persecuted by other fishes, bigger and stronger than themselves, and that they know quite well that they will be overtaken if they remain in the water. They do not usually rise to a height of more than a few feet above the surface, and the greatest distance to which they can travel without falling back into the water seems to be about two hundred yards. Whether they can alter the direction of their course while they are in the air is uncertain. Some observers say that they can, while others declare that they cannot. But it is possible that they may sometimes do so by just touching the crest of a wave with their tails.

Flying fishes are found in all the warmer parts of the sea, and are very common in the Mediterranean and the West Indies.

THE HERRING

Like the mackerel, the herring is one of those fishes which live in vast shoals and are of great value as a cheap and nutritious food. These shoals consist of millions upon millions of fishes, and when they are swimming near the surface of the sea their presence can generally be detected by the numbers of sea-birds which follow them and devour them in countless

thousands. Whales, too, often follow the shoal for days together, and sharks and many other big fishes do the same. Yet nothing seems to lessen their numbers.

These shoals generally appear in the same parts of the sea, year after year, at the same season. But sometimes the herring will desert their favorite haunts without any apparent cause. During spring and early summer they remain in deep water; but in June and July they come in nearer the coast in order to spawn.

GOBIES

There are still several very curious and interesting fishes about which we should like to tell you; and among these are the gobies. Many different kinds of these odd little creatures are found in different parts of the world other than North America; but perhaps the best known of all is the black goby, which is very common off British coasts. You can often catch it by fishing with a small net in the pools which are left among the rocks as the tide goes out. And if you look into these pools from above, you may often see it clinging to the rocks round the margin. It does this by means of the fins on the lower part of its body, which are made in such a manner that when they are placed side by side together they form a kind of sucker. And if you keep the fish in an aquarium, it has an odd way of suddenly darting at the side of the tank, clinging to it with its fins, and staring at you through the glass.

Some of the gobies make nests in which to bring up their little ones, just as the sticklebacks do. One of them, the spotted goby, which is found rather commonly in the lower reaches of the Thames, nearly always takes one of the shells of a cockle for this purpose. First it turns the shell upside down; then it scoops out the sand from beneath it, and smears the surface of the hollow with slime from its own body; and then it piles loose sand over the shell, so as to keep it in position. Lastly, it makes a little tunnel by which to enter the nest from outside. This work is always performed by the male. When the nest is quite finished the female comes and lays her eggs in

it, after which the male keeps guard over them until they hatch, about eight or nine days later.

MUD-SKIPPERS

More curious still are these fishes, which are found on the coasts of the tropical seas, and often make their way for some little distance up the estuaries of rivers. They have singular eyes, which are set on the upper surface of the head, and can be poked out to some little distance and drawn back again in the oddest way. And besides that, these eyes have eyelids. Then the lower fins are made just like those of the gobies, but with an even greater power of clinging, so that the fish can climb by means of them. Often these queer little creatures leave the sea altogether and skip about on the muddy shore, or even climb up the trunks of the trees which overhang the water. Sometimes they will rest for quite a long time on the spreading roots, snapping at the flies and other small insects which come within reach. They do not look like fishes at all as they do so. They look much more like rather big tadpoles. And if they are suddenly startled they go hopping and skipping back into the water, not diving at once, but leaping along over the surface, very much as a flat stone does when thrown sideways from the hand.

Some of these fishes were kept for some time at the London Zoo, and when they were out of the water they had an odd way of lying at full length and raising their heads and the front part of their bodies by means of their lower fins, so that they reminded one very much of a man with his elbows resting upon the table.

PIPE-FISHES

The pipe-fish has its mouth drawn out into a very long snout, so that it forms a kind of tube; the body is sixteen or eighteen inches long, yet scarcely stouter than an ordinary drawing-pencil; and the only fin, besides a small one on the back, is a tiny one at the very tip of the tail. Besides this, the whole head and body are covered with bony plates, which form a

kind of coat of mail. And the fish is even odder in habits than in appearance, for when the eggs are laid they are put into a pouch in the lower part of the body of the male, and are kept there until they hatch! It is even said that after the little ones are hatched and are able to swim about in the water, they will return into the pouch of the parent in moments of danger, just as young kangaroos will into that of their mother. But this does not seem to have been proved.

Pipe-fishes are not uncommon on our coasts, and you may often find them in the pools among the rocks when the tide is out. They swim half erect in the water, and if you watch them carefully you may see them poking their long snout-like mouths in among the seaweeds in search of food, standing on their heads among the eel-grass, in which position they are hard to see, or blowing furrows in the sand at the bottom of the pool in order to turn out any small creatures which may be lying hidden in it.

THE SEA-HORSE

Closely related to the pipe-fish is the sea-horse, which reminds one of the knight in a set of chessmen. It has a long and slender tail, which is prehensile, like that of a spider-monkey; and by means of this organ the fish anchors itself firmly down to the stems of seaweeds, or to any small object which may be floating on the surface of the water.

The eyes of this fish can be moved independently of each other, like those of a chameleon; and if you keep one of these creatures in a bowl of sea-water and watch it for a few minutes, you will find it hard to believe that it is not purposely "making faces" at you!

The male sea-horse, like the male pipe-fish, has a pouch underneath his body, in which the eggs are placed as soon as they are laid, and are kept until they hatch.

The sea-horse swims by means of a single fin on its back, which acts on the water very much like the screw of a steam-boat. Just at the back of its head are two more fins, and when these are thrown forward they look like the ears of a horse,

increasing the queer resemblance of its long head to that of a pony.

Sea-horses are found in most of the warmer seas, and in summer float north with the Gulf Stream, so that they are frequently seen near New England.

CONGERS

Just as there are eels which live in the fresh water, so there are eels which live in the sea. These are known as congers, and very often they grow to a great size. A conger eight feet long is by no means uncommon; and a fish of this length will weigh at least one hundred pounds.

Congers generally live in rather shallow water off a rocky coast, where there are plenty of nooks and crevices in which they can hide during the daytime. It is rather curious to find that those which live in muddy places are nearly always dark brown or black in color, while those which lie upon sand are light-colored, and sometimes almost white.

These eels are generally caught by means of long lines, which are set at intervals with short "snoods" just like those which are used in catching cod. The hooks are generally baited with pilchards, or else with pieces of the long arms of cuttles. When the congers are lifted on board the scene is usually an exciting one, for they are very powerful and active, and go twisting and writhing about in the most extraordinary manner, slapping vigorously on all sides with their long tails. These tails, too, to some extent, are prehensile, and sometimes the fishes will seize the gunwale of the boat, and then, with a sudden effort, pull themselves over the side and drop back into the water. As soon as they are lifted on board, the fishermen always try to stun them by a heavy blow on the lower side of the body, after which, of course, they can be easily killed.

Congers feed, as a rule, upon mollusks, which we wrongly call shell-fish, devouring them shells and all. They will also eat small fishes, however, and sometimes they are cannibals; for inside the body of one of these fishes a young conger was found that was three feet in length!

AMPHIOXUS, OR LANCELET

In this we see a creature so curiously formed that a good many naturalists have doubted whether it ought to be ranked among the fishes at all. For in appearance it is much more like a slug; and it has no skull, and no brain, and no bones, and no eyes, and no gills, and no heart! It has a fin running along its back, however, and although it has no spine, it possesses a spinal cord. So it is considered as the very lowest of all the fishes, and as a kind of link between the animals with bones and those without them.

This strange little creature is about two inches and a half long when fully grown, and is so transparent that one can almost see through its body. It is very active, and can wriggle and twist about in the water, or on the mud, with considerable speed. It spends most of its life concealed under large stones, or lying almost buried in the muddy sand at the bottom of the sea. And it seems to feed upon those minute atoms of decaying animal and vegetable matter which are always floating about in countless millions in the waters of the sea.

INVERTEBRATES

CHAPTER XXXII

INSECTS

WE now come to the second of the two great divisions of the animal kingdom, namely, the invertebrates, which includes all those creatures which have no bones. This division in its turn consists of a good many classes, just as that of the vertebrates does; and among these is that of the insects, the peculiarity of which is that they must pass through three stages of development before they reach their perfect form, namely: first the egg; then the grub, or caterpillar; and then the chrysalis, or pupa.

You can easily tell an insect when you see it by remembering one or two simple rules.

In the first place, its body is always divided into three principal parts, which are known as the head; the thorax, or chest; and the hind body.

In the second place, it always has six legs. Spiders have eight legs. Centipedes and millepedes have many legs. But an insect never has more nor less than six. And each of these limbs is made up of a thigh, a lower leg, and a foot; while the foot itself has from two to five little joints, the last of which usually has a pair of tiny claws at the tip.

Besides these, there are several other ways in which insects differ from the rest of the vertebrates. We need only tell you about one of them, however, and that is that in some form or other they always have four wings. Sometimes, it is true, you cannot see these wings. That is because they are not developed and cannot be used for flying. But still they are there, and by means of the microscope it is almost always easy to detect them.

These wings, however, take all sorts of forms. The wings of a butterfly, for example, are very different from those of a beetle or a bee; and because of these differences in the wings, insects are divisible into several smaller groups, which we call orders.

BEETLES

First comes the order of the beetles. These are called *Coleoptera*, or sheath-winged insects, because their front wings, instead of being formed for flight, are turned into horny or leathery sheaths, or elytra, which cover up and protect the lower pair while not in use.

At least 150,000 different kinds of beetles have already been discovered in various parts of the world, of which America possesses tens of thousands; and probably quite as many more remain to be distinguished. Of these we can only mention a few of the most interesting.

The tiger-beetles are so called because they are such fierce and voracious insects, spending most of their time in chasing and devouring other insects. The commonest of them is about half an inch long, and is bright green above and coppery below. You may often see it darting about in the hot sunshine, and if you try to catch it you will generally find that it flies away as quickly as a bluebottle.

Ground-beetles are common in gardens. One often seen is about an inch long, and is deep black in color, with a narrow band of violet running round the outer edge of its wing-cases. This, too, is a creature of prey. It cannot hurt you; but if you pick it up it will make your fingers smell very nasty. For it can pour out from its mouth a drop or two of a dark-brown liquid which has a horrible odor.

Then there are a good many beetles which live in streams and ponds, and are called water-beetles in consequence. They can swim and dive very well, and are also able to fly. Almost every night they go for long journeys through the air. And when they want to go back into the pond they hover above it for a moment, fold their wings, and drop into the water with a splash. Only

sometimes they fly over the roof of a greenhouse, and mistake that for a pond; and then you can imagine the result!

The cocktails are beetles with short wing-cases and very long, slender bodies, which they carry turned up at the rear end. Some of them are quite large, like the ugly black "coach-horse," but many are very small. Indeed, most of the "flies" which get into one's eyes on warm sunny days in England are really tiny cocktail beetles, and the reason why they make one's eyes smart so dreadfully is that they pour out a little drop of an evil-smelling liquid from their mouths, just like the purple ground-beetle.

SCAVENGERS

The burying-beetles are so called because they bury dead animals. Have you ever wondered why we so seldom find a dead mouse or a dead bird, although these creatures must die in thousands every day? One reason is that as soon as they are dead a couple of "scavengers" are almost sure to come and bury them. They are big black beetles, sometimes with two broad yellow stripes across their wing-cases, and they dig by means of their heads, scooping out the earth from under the carcass till it has sunk well below the surface of the ground. Then they lay their eggs in it, come up to the surface, shovel back the earth till the dead body is quite covered over, and then fly away. And when the eggs hatch, the little grubs which come out from them feed upon the carcass.

Among the largest beetles are those called stag-beetles because the jaws of the male look very much like the horns of a stag. Those of the female are much smaller, but are so sharp and strong that they can really give a rather severe bite. These occur in various parts of the world, and are fond of flying slowly about on a warm summer evening, generally about twenty or thirty feet from the ground.

The cockchafer is common everywhere in spring, and if you shake a young birch-tree, or a hazel-bush, three or four of the great clumsy insects will very likely come tumbling down. They are rather more than an inch long, very stoutly and heavily

built, and are chestnut brown in color, while their bodies are drawn out into a kind of point behind. The grubs of these beetles live underground, and do a great deal of mischief in fields and gardens, for they feed upon the roots of the plants, and very soon kill them.

Dor-beetles, too, are very common everywhere. You may often see them flying round and round in great circles on warm summer evenings, making a loud humming noise as they do so. They often blunder in at open windows, attracted by the lamp-light, and children are afraid of them, but they can do no harm. If you catch one you will find that it is nearly black. You will also see that its front legs are broad and strong, and that they are set with a row of stout horny teeth. With these legs the beetle digs, using them with such address that in the course of an hour or two it will sink a hole in the ground ten or twelve inches deep, in order to lay its eggs at the bottom.

The famous *Scarabæus* of Egypt, which in days of old some of the people of that country used to revere, because they thought it a symbol of immortality, is really a kind of dor-beetle.

SKIPJACKS AND GLOWWORMS

Skipjacks, too, are beetles. You may know them by their long, narrow, glossy bodies, and by the fact that the head is hidden under the thorax, so that you can hardly see it from above. One very odd thing about them is that they are constantly losing their footing and rolling over on their backs; and their bodies are so shiny, and their legs are so short, that when they do so they cannot get up again in the ordinary manner. But after lying still for a moment they arch themselves into the form of a bow, resting only upon their heads and the very tips of their tails, and suddenly spring into the air, making an odd clicking noise as they do so. And as they fall they turn half round, and so alight upon their feet. For this reason they are often known as click-beetles.

These insects are the parents of the well-known wireworms, which often do such mischief in our fields and gardens, living

underground for three or even four years, and feeding upon the roots of the crops, and of such bushes as the currant.

Then the glowworm is a beetle. Perhaps you may have seen its little pale green lamp shining in the grass on a summer evening. The light comes from a liquid inside the hind part of the body, the skin of which is transparent, and forms a kind of window, so that it can shine through; and the insect has the power of turning on its light and shutting it off at will. The lamp of the female beetle is very much brighter than that of the male, and while the male has both wing-cases and wings, and can fly very well indeed, those of the female are so small that one can hardly see them. Indeed, she looks much more like a grub than a beetle.

DEATHWATCHES AND OIL-BEETLES

Deathwatches are small brown beetles which burrow into dead wood and call to one another by tapping with their horny heads. You may often hear them if you happen to be lying awake at night in a room in which there is old woodwork; and in former days people were silly enough to think that when this sound was heard it was a sign that somebody in the house was going to die! That is why these beetles are called deathwatches. They are quite small, and are brown in color, with rather long feelers and legs.

Crawling on grassy banks in the warm sunshine on bright spring days, you may often see a number of oil-beetles. These are large bluish-black insects which have an odd habit, if you pick them up, of squeezing out little drops of a yellow oily liquid from the joints of their legs! This oil has a pungent smell, and no doubt prevents birds, etc., from eating them. You will notice that the female beetles have enormous hind bodies, which they can hardly drag along over the ground. This is because they contain such a very large number of eggs, thirty thousand often being laid by a single beetle. She places them in batches in holes in the ground, and very soon afterward they hatch, and odd-looking little grubs with six long legs come out of them. No sooner have they left the egg-shells than these tiny creatures

hunt about for a flower with sweet juices, which is likely to be visited by a wild bee. When they find one, they climb up the stem and hide among the petals. Then, when the bee comes, they spring upon it and cling to its hairy body, and so are carried back to its nest, where they feed upon the food which the bee had stored up for its little ones.

WEEVILS AND OTHER BEETLES

A great many beetles have a long beak in front of the head, with the jaws at the very tip. These are called weevils, and many of them are very mischievous. Grain of various kinds, for example, is destroyed in enormous quantities by the wheat-weevil and the rice-weevil, while the nut-weevil is the cause of those "bad" nuts which no doubt most of you know only too well. The mother beetle bores a hole through the shell of the nut while it is small, and the little grub which hatches out from the egg she leaves inside it feeds upon the kernel, leaving nothing behind but a quantity of evil-tasting black dust.

One of the handsomest of European insects is the musk-beetle, which you may often find sunning itself on the trunks and leaves of willow-trees in England in July. Often you can smell it long before you find it, for it gives out a strong odor much like that of musk. This beetle is sometimes nearly an inch and a half long, with long legs and still longer waving black feelers. In color it is rich golden green with a tinge of copper. But if you put one of its wing-cases under the microscope, it looks like a piece of green velvet studded all over with diamonds, and rubies, and sapphires, and emeralds, and topazes, which seem to turn into one another with every change of light.

The grub of this beetle lives inside the trunks of dying willow-trees, and feeds upon the solid wood.

Then there are the turnip-fleas, little black beetles with a yellow stripe on each wing-case, which skip about just as fleas do, by means of their hind legs. They are only too common in turnip-fields, and often do most serious mischief, nibbling off the seed-leaves of the young plants as soon as they push their way

above the surface of the ground, and so destroying the greater part or even the whole of the crop.

And, lastly, there are the ladybirds, common everywhere. But perhaps you did not know that they are among the most useful of insects. The fact is that both as grubs and as perfect insects they live upon the green blight, or greenfly, an aphid which is terribly mischievous in fields and gardens, and destroy it in thousands of thousands. Indeed, if it were not for ladybirds, and for one or two other insects which help them in their task, we should find it quite impossible to grow certain crops at all.

EUPLEXOPTERA

Next after the beetles comes the order of the *Euplexoptera*, which means beautifully folded wings. This order contains the earwigs. We do not know much about these insects in the United States; but they are so constantly spoken of in books about England, where they are numerous, that it will be well to describe them.

Perhaps you did not know that earwigs have wings; and certainly one does not often see these beetles flying. But nevertheless they have very large and powerful wings, only during the daytime, while they are not being used, these organs are folded away in the most beautiful manner under the tiny wing-cases. By night, however, earwigs often fly; and when they settle, they fold up their wings most cleverly by means of the horny pincers at the tail-end of their bodies, and then pull the wing-cases down over them!

That is the real use of the pincers, although the earwig is able to give quite a smart pinch with them if it is interfered with.

Another very curious fact about the earwig is that the mother insect heaps her eggs together into a little pile, and sits over them until they are hatched. If you turn over large stones early in the spring you may often find a mother earwig watching over her eggs in this odd manner, and she will allow herself to be torn in pieces rather than desert her charge.

ORTHOPTERA

Next comes this order, the name of which means straight-winged insects, so-called from the way in which the wings are folded. This order contains many very well-known insects.

There is the cockroach, for example, which is so common and so mischievous in our houses. It is often called the black beetle, although it is not a beetle at all, and is not black, but dark reddish brown. It is remarkable for several reasons. One is that while the male has large wing-cases and broad, powerful wings, those of the female are very small indeed, so that she cannot possibly fly. And another is that the eggs are laid in a kind of horny purse, about a quarter of an inch long, with a sort of clasp on one side. These little purses are hidden away in all sorts of dark corners, and if you open one you will find two rows of little eggs inside it, arranged rather like the peas in a pod.

The crickets, too, belong to this order.

Of course you have often heard the big black cricket chirping merrily away in the fields; and in Europe they have a kind called the house-cricket, which comes into the house, and is often spoken of as "the cricket on the hearth" in the kitchen. It is not correct, however, to speak of the "note" or "song" of this insect, for it is not produced in the throat at all, but is caused by rubbing one of the wing-cases upon the other. You will notice, on looking at a cricket, that in each wing-case there is a kind of stout horny rib, which starts from a thickened spot in the middle. Now in the right wing-case this rib is notched, like a file, and when it is rubbed sharply upon the other the loud chirping noise is produced.

The feelers of the cricket are very long and slender, and at the end of the body of the male are two long hairy bristles, which seem almost like a second pair of feelers, warning the insect of danger approaching from behind. At the end of the body of the female is a long spear-like organ, with a spoon-like tip. This is called the ovipositor, and by means of it the eggs are laid in holes punched in the soil.

Crickets have large wings, and fly rather like the woodpeckers, rising and falling in the air at every stroke.

Another kind of cricket lives in holes in the ground, which it digs by means of its front legs. These limbs are formed almost exactly like the fore feet of the mole, and for this reason the insect is known as the mole-cricket. It is generally found in sandy fields, and scoops out a chamber almost as big as a hen's egg at the end of its burrow, in which to lay its eggs and where it lies, showing only its jaws and great front legs until some small creature comes near upon which it may pounce for food.

GRASSHOPPERS

Right here has come a mixing up of names between the English, as spoken and written in Great Britain, and that used in the United States. When an Englishman speaks of a grasshopper he means the related insect which we call a cicada, or katydid, and this *we* call a locust; but when *he* says "locust" he refers to what *we* call "grasshopper." We suspect he is nearer right than we are, who have unfortunately fallen in with the mistake of some ignorant early settler. At any rate the locusts of which we read in the Bible, and in books of travel in desert regions, are all of the same race as our grasshoppers. None of the cicada tribe could ever do so much damage.

Grasshoppers (to stick to our own name) abound in all warm countries, especially in those which in summer, at least, are hot and dry, such as Egypt, or Syria, or parts of India. They feed exclusively on leaves, blades of grass, and the like, and are strong fliers; and in countries that are favorable to them, where they are always very plentiful, certain species sometimes become excessively abundant, and then spread over the land, and swarm away to neighboring countries, in such immense numbers that they devour every green leaf and every blade of grass, or spear of grain, until they leave the ground as bare as if it had been swept by fire.

Nor is this the worst, for wherever they go the females push

quantities of eggs down into the ground. The following summer these eggs hatch, and the devastation of the previous year is repeated, for where before dense clouds of flying grasshoppers descended from the sky, now enormous armies of grubs march over the ground, climb all the plants and bushes, and devour all that has newly sprung up.

Millions may be killed by fire or other means, but it has little effect, and the farmers and grazers of a region so visited are all but ruined—perhaps wholly so.

When, in the last century, men began to settle on the prairies of the far West, they met this plague; and between 1870 and 1880 the gardens and farms and young orchards of Kansas, Nebraska, and other western districts, were ruined again and again. The government sent out several of the wisest entomologists it could employ to study the insects, and they found that these destructive red-legged grasshoppers had their home in the dry foothills of the Rocky Mountains, especially toward the north. They learned a great deal about the habits of the insects, and reported that there seemed no remedy just at hand; but that the more the West was settled and cultivated, the more grass and other food would be provided for the grasshoppers, so that they would not have to make those wide flights, and the more the plowing of the land and burning of rubbish would destroy their eggs, so that gradually the pest would become less and less, until finally it would cease to be troublesome. This has turned out to be true, and already the fear of grasshoppers has departed. The same thing is taking place in Egypt and some other improving countries, which no longer suffer from the plague of locusts as they used to do.

The wonderful walking-stick and the leaf-insects also belong to this order. They are so marvelously like the objects after which they are named that as long as they keep still it is almost impossible to see them. They seem to know this perfectly well, and will remain for hours together without moving, waiting for some unwary insect to come within reach, for they are among the insects of prey. They are found in all the warmer parts of the world.

Equally curious, too, is the praying-mantis, which also is

very much like a leaf. It has very long front legs, with a row of sharp teeth running along their inner margin, and when it is hungry it holds these limbs over its head, in very much the attitude of prayer. That is why it is called the praying-mantis. Then when an insect comes within reach it strikes at it, and seizes it between the upper and lower parts of these limbs, so that the long spike-like teeth enter its body and hold it in a grip from which there is no escape. These occur in various parts of the world, including the warmer parts of America.

DRAGON-FLIES AND MAY-FLIES

The dragon-flies belong to another division of the *Orthoptera*. You must know these insects very well by sight, with their long slender bodies and their broad gauzy wings; for they are common in almost all parts of the country, and you can hardly go for a ramble on a sunny day in summer or autumn without seeing them in numbers. There are a good many different kinds. Some have yellow bodies, some blue ones, and some red ones, and the loveliest of all perhaps are the graceful demoiselles, whose wings are rich metallic purple. You may sometimes see these beautiful insects flitting to and fro over streams and ditches.

All the dragon-flies spend the earlier part of their lives in the water. The grubs are very curious creatures and catch their prey in a curious way. Underneath the head is an organ called the mask. This consists of two horny joints, which fold upon one another while not in use. At the end of the second joint is a pair of great sickle-shaped jaws, and when the grub sees a victim it swims quietly underneath it, unfolds the mask, reaches up, and seizes it with the jaws. Then it folds the mask again, and by so doing drags the prisoner down against the true jaws, by means of which it is leisurely devoured.

This grub swims, too, in a singular manner. At the end of its body you will notice a short sharp spike. Now this spike really consists of five points, which can be opened out into the form of a star; and in the center of this star is a small round hole, which is really the entrance to a tube running right through

the middle of the body. And the grub swims by filling this tube with water, and then squirting it out again with all its force, so that the escaping jet pushes, as it were, against the surrounding water, and drives the insect swiftly forward by the recoil.

Dragon-flies are voracious, and always seem to be hungry. They feed entirely upon other insects, and spend almost all their time in chasing and devouring them.

The May-fly, or June-fly, also belongs to this order. One sometimes sees it in thousands, dancing, as it were, up and down in the air toward evening on warm spring days, in the neighborhood of water. You can always tell this insect by the three long thread-like bristles at the end of its body.

Most people think that this insect only lives for a single day. This, however, is not strictly true, for in damp weather many May-flies live for three or four days. Before they become perfect flies, however, they have lived for nearly two years in the muddy banks of rivers and ponds, in the form of long slender-bodied grubs. These grubs always make their burrows with two entrances, in the form of the letter U turned sideways, so that they can easily leave them without having to turn round.

TERMITES

The most wonderful of all the insects which belong to this order, however, are the termites. Often these creatures are known as white ants, and although they are not really ants, they are certainly very much like them. In Africa they make marvelous nests of clay, which are often twelve or fourteen feet high, and are so very large that a church, a parsonage, and a school-room have been built of clay slabs cut from the walls of a single termites' nest! These nests are made up of a wonderful series of chambers and galleries, and in the middle is the royal cell, in which the "king" and "queen" live. For in every termites' nest there is one perfect male and one perfect female, which are treated with very great respect, and have a kind of palace, as it were, all to themselves. And the rest of the insects in the nest

are either imperfect males, which are called soldiers, or imperfect females, which are called workers.

The "king" is quite a handsome and graceful insect, with broad and powerful wings; and the "queen," at first, is very much like him. But they never take more than one flight in the air, and as soon as that is over they actually break off their own wings close to their bodies! Then they burrow into the ground and begin to form a nest. Before long, the workers build the palace for the royal couple; and as soon as they have been shut up inside it the body of the queen swells to a most enormous size, so that she can no longer walk at all. This is because of the vast number of eggs, developing within her body, which she at once begins to lay at the rate of many thousands in a single day. As fast as she lays them they are carried off by the workers, which also take care of the little grubs that hatch out from them, just as bees do.

The duty of the soldiers, as their name implies, is simply to fight, and if a hole is broken in the side of the nest they hurry to the spot at once, and begin to snap with their jaws at the foe. And these jaws are so sharp and so powerful that they can really give a very smart bite. The workers are a good deal smaller, and they have to build the nest and keep it in repair, to find food for the grubs, and take care of them, and wash them, and feed them, and do everything else that is necessary for the welfare of the colony.

The grubs of these insects are fed upon dead wood, which is generally obtained from the trunks and branches of trees. But termites are sometimes very troublesome in houses, for they will devour the woodwork and the furniture and the books, leaving nothing but a thin shell of wood or paper behind them.

There are a good many different kinds of these wonderful insects, and they are found in warm countries in all parts of the world.

The North American termites do not build great clay hills or houses above ground, but some species make extensive galleries beneath the surface, while others hollow out a dead stump, or the dying branch of a tree, or even an old fence-post or telegraph pole, until it becomes a mere sponge, with a thin outside shell.

NEUROPTERA

The *Neuroptera*, or nerve-winged insects, form an order whose wings are divided up by horny nerves, or nervures, into such numbers of tiny cells, that they look as if they were made of the most delicate lace.

The caddis-flies belong to this order—brownish insects with long thread-like feelers and broad wings, which are folded tent-wise over the body when they are not being used. They are very common near ponds and streams, in which they pass the earlier part of their lives, living down at the bottom in most curious cases, which cover them entirely up with the exception of their heads.

These cases are made of all sorts of materials. Some caddis-grubs merely fasten two dead leaves together, face to face, and live between them. Others make a kind of tube out of grains of sand, or tiny stones, or little bits of cut reed, all neatly stuck together with a kind of glue which resists the action of water. But the oddest case of all is made of tiny living water-snails, and you may sometimes see fifteen or twenty little snails all trying to crawl in different directions, while the grub is unconcernedly pulling them along in another!

The grubs never leave these cases, but drag them about with them wherever they go. And when they find that their odd little homes are becoming too small, they just cut off a little piece at the end and add a little piece on in front, rather larger in diameter. And so they always manage to keep their homes of exactly the proper size.

Most likely, too, you have heard of the ant-lion fly, which is a rather large fly with a slender body and four long narrow wings, and is found in many parts of the south of Europe, as well as in America. But the interest lies in the grub, or “ant-lion” proper, which has a most singular way of catching its insect victims. It digs a funnel-shaped pit in the sand, about three inches in diameter and two inches deep, by means of its front legs and its head. Then it almost buries itself at the bottom, and lies in wait to snap up any ants or other small insects which may be

unfortunate enough to fall in. And if by any chance they should escape its terrible jaws and try to clamber up the sides, it jerks up a quantity of sand at them, and brings them rolling down again to the bottom, so that they may be seized a second time.

A relation of the ant-lion is called the lacewing fly, and is a pretty pale-green insect with most delicate gauzy wings, over which, if you look at them in a good light, all the colors of the rainbow seem to be playing; and its eyes glow so brightly with ruby light that one can scarcely help wondering if a little red lamp is burning inside its head. You may often see it sitting on a fence on a warm summer day, or flitting slowly to and fro in the evening.

This fly lays its eggs in clusters on a twig, or the surface of a leaf, each egg being fastened to the tip of a slender thread-like stalk. The result is that they do not look like eggs at all; they look much more like a little tuft of moss. When they hatch, a number of queer little grubs come out, which at once begin to wander about in search of the little greenfly insects upon which they feed. And when they have sucked their victims dry, they always fasten the empty skins upon their own backs, till at last they are covered over so completely that you cannot see them at all!

CHAPTER XXXIII

INSECTS (Continued)

WE now come to a very large and important order of insects indeed—that of the *Hymenoptera*. This name means membrane-winged, and has been given to them because their wings are made of a transparent membrane stretched upon a light horny framework. It is not a very good name, however, for many insects which do not belong to this order at all have their wings made in just the same way. All the *Hymenoptera*, however, have the upper and lower wings fastened together during flight by a row of tiny hooks, which are set on the front margin of the lower pair, and fit into a fold on the lower margin of the upper ones.

BEES

The bees belong to this order, and most wonderful insects they are—so wonderful, indeed, that a big book might easily be written about them. They are divided into two groups, namely, social bees and solitary bees.

The social bees are those which live together in nests; and our first example, of course, must be the hive-bee.

In every beehive there are three kinds of bees. First, there are the drones, which you can easily tell by their stoutly built bodies and their very large eyes. They are the idlers of the hive, doing no work at all, and sleeping for about twenty hours out of every twenty-four. For six or eight weeks they live only to enjoy themselves. But at last the other bees become tired of providing food for them. So they drive them all down to the bottom of the hive and sting them to death one after another. And that is the end of the drones.

Next comes the queen, the mistress of the hive. You can easily recognize her, too, for her body is much longer and more slender

than that of the other bees, and her folded wings are always crossed at the tips. The other bees treat her with the greatest respect, never, for example, turning their backs toward her. And wherever she goes a number of them bear her company, forming a circle round her, in readiness to feed her, or lick her with their tongues, or do anything else for her that she may happen to want. Her chief business is to lay eggs; and she often lays two or three hundred in the course of a single day.

Lastly, there are the workers. There are many thousands of these, and they have to do all the work of the hive, making wax and honey, building the combs, and feeding and tending the young.

The comb is made of six-sided cells, and is double, two sets of cells being placed back to back. Some of these cells are used for storing up honey. But a great many of them are nurseries, so to speak, in which the grubs are brought up. These grubs are quite helpless, and the nurse-bees have to come and put food into their mouths several times a day.

Fastened to the outside of the combs, there are always several cells of quite a different shape. They are almost like pears in form, with the smaller ends downward. These are the royal nurseries in which the queen grubs are brought up.

Bees feed their little ones with a curious kind of jelly, made partly of honey and partly of the pollen of flowers. This is called bee-bread; and it is rather strange to find that one kind of bee-bread is given to the grubs of the drones and the workers, while quite a different kind is given to those of the queens.

You will want, of course, to know something about the sting of the bee—though perhaps you already know enough of the pain it can give! This is a soft organ, enclosed in a horny sheath, with a number of little barbs at the tip. When a bee stings us, it is often unable to draw the sting out again, because of these barbs. So it is left behind in the wound, and its loss injures the body of the insect so severely that the bee very soon dies. The poison is stored up in a little bag at the base of the sting, which is arranged in such a way that when the sting is used a tiny drop of poison is forced through it, and so enters the wound.

Then, no doubt, you would like to know how bees make honey;

but that neither we nor any one can tell you. All we know is, that the bee sweeps out the sweet juices of flowers with its odd brush-like tongue and swallows them; that they pass into a little bag just inside the hind part of its body, which we call the honey-bag; and that by the time the bee reaches the hive they have been turned into honey. But how or why the change takes place no one knows at all.

Bumblebees, or humblebees, are also social bees; but their nests are not quite as wonderful as those of the hive-bee, and their combs are not so cleverly made.

One of these bees is called the carder, and you may sometimes find its nest in a hollow in a bank. But it is not at all easy to see, for the bee covers over the hollow with a kind of roof, which is made of moss and lined with wax. And this looks so like the surrounding earth that even the sharpest eye may often pass it by. When this roof is finished, the bee makes a kind of tunnel, eight or ten inches long and about half an inch in diameter, to serve as an entrance; and this is built of moss and lined with wax in just the same way.

On a warm sunny day in spring you may often see one of these bees flying up and down a grassy bank searching for a suitable burrow in which to build. Then you may be quite sure that she is a queen. For among bumblebees the drones and workers die early in the autumn, and only the queens live through the winter.

Solitary bees are very common almost everywhere, and you may find their nests in all sorts of odd places. One kind of solitary bee, for example, builds in empty snail-shells, and another in small hollows like keyholes. A third gnaws out a burrow in the decaying trunk of an old tree, or in the timbers of a barn or house-porch and makes a number of thimble-shaped cells out of little semicircular bits of rose-leaf, which it cuts out with its scissor-like jaws. Haven't you noticed how often the leaves of rose-bushes are chipped round the edges, quite large pieces being frequently cut away? Well, that is the work of the leaf-cutter bee, as this insect is called, and very often not a single leaf on a bush is left untouched.

But the commonest of all the solitary bees burrows into

the ground. As you walk along the pathway through a meadow in spring, you may often see a round hole in the ground, just about large enough to admit an ordinary drawing-pencil. That is the entrance to the burrow of a solitary bee; and if you could follow the tunnel down into the ground you would find that it was about eight or ten inches deep, and that at the bottom were four round cells. In each of these cells the bee lays an egg. Then it fills the cells with flies, or spiders, and caterpillars, or beetles, for the little grubs to feed upon when they hatch out. For solitary bees do not nurse their little ones, as social bees do, and feed them several times a day. But at the same time the grubs are quite helpless, and cannot possibly go to look for food for themselves. So the mother bee has to store up sufficient to last them until the time comes for them to spin their cocoons and pass into the chrysalis state. These are only a few examples of a large number of interesting ways in which the solitary bees in various parts of the world provide for their young.

WASPS

Wasps make nests which are almost as wonderful as those of the hive-bee. That of the common yellow-jacket wasp is generally placed in a hole in the ground, or in a cavity under a stone, and is made of a substance very much like coarse paper, which the wasps manufacture by chewing wood into a kind of pulp. You may often see them sitting on a fence, or on the trunk of a dead tree, busily engaged in scraping off shreds of wood for this purpose. When the nest is finished it is often as big as a football, and of very much the same shape; and inside it are several stories, as it were, of cells placed one above another, and supported by little pillars of the same paper-like material. These cells are six-sided, like those of the hive-bee, but they are squared off at the ends, instead of being produced into pointed caps, and they always have their mouths downward. In a large nest there may be several thousands of these cells, and very often three generations of grubs are brought up in them, one after the other.

The hornet, which is really a kind of big wasp, makes its nest in just the same way, but places it on a beam in an out-house, or in a hole which the sparrows have made in the thatched roof of a house, or in a hollow tree, or perhaps hangs it in the open air to the bough of a tree.

ANTS

Even more wonderful than bees and wasps are the ants, which sometimes do such extraordinary things that we are almost afraid to tell you about them, for fear that you might not believe us. There are ants, for example, which actually take other ants prisoners and make them act as slaves, forcing them to do all the work of the nest, which they are too lazy to do themselves; and there are ants which keep large armies, sometimes more than one hundred thousand strong; and there are many ants which harvest grain and store it away in underground barns! Many ants, too, keep little beetles in their nests as pets, and fondle and caress them just as one might pat a dog, or stroke a favorite cat. They even allow them to ride on their backs; while, if the nest is opened, the first thing they think of is the safety of their pets which they pick up at once and hide away in some place of safety, even before they carry off their own eggs and young. They also pet tiny crickets and small white wood-lice in just the same way.

Then ants have little "cows" of their own, which they "milk" regularly every day. These are the greenfly or aphid insects which do so much harm in our gardens and fields, plunging their beaks into the tender shoots and fresh green leaves of the plants, and sucking up their sap unceasingly. And as fast as they do so they pour the sap out again through two little tubes in their backs, in the form of a thin, sticky, very sweet liquid which we call honeydew. Now the ants are very fond of this liquid, and if you watch the greenfly insects which are almost always so plentiful on rose-bushes, you may see the ants come and tap them with their feelers. Then the little creatures will pour out a small quantity of honeydew from the tubes on their backs, which the ants will lick up. That is the

way in which ants milk their little cows, and they are so fond of the honeydew that they will carry large numbers of these aphides into their nests and keep them, like a herd of cattle, all through the winter, so that they may never be without a supply of their favorite beverage!

Ants, like bees and wasps, almost always consist of drones, queens, and workers. Only the drones and queens have wings, and these are seldom seen until the end of August. But then they make their appearance in vast swarms, which are sometimes so dense that from a little distance the insects really look like a column of smoke. They only take one short flight, however, and when this is over they come down to the ground and snap off their wings close to their bodies, just as termites do.

One of the most curious of all these insects is the parasol-ant, of South America, which makes enormous dome-shaped nests of clay. But as the clay will not bind properly by itself, the insects work little pieces of green leaf up with it. These pieces of leaf are generally obtained from an orange plantation, perhaps half a mile distant. And when the ants are returning from their expedition, each holds its little piece of leaf over its head as it marches along, just as if it were carrying a tiny green parasol!

Another very famous ant is the African driver, which owes its name to the way its vast armies drive every living creature before them. Insects, reptiles, antelopes, monkeys, even man himself, must give way before the advancing hosts of the drivers; for it is certain death to stand in their path.

SAW-FLIES

The saw-flies also belong to the order of the *Hymenoptera*. These flies are so called because the female insects have two little saws at the end of the body, which work in turns, one being pushed forward as the other is drawn back. With these they cut little grooves in the bark of twigs, or in the midribs of leaves, in which they place their eggs by means of the ovipositor between the saws.

Some of these insects are extremely mischievous. The grub

of the turnip saw-fly, for instance, often destroys whole fields of turnips, while the currant saw-fly is equally destructive to currants and gooseberries. One often sees bushes which it has entirely stripped of their leaves.

You may always know a saw-fly grub by the fact that it has no less than twenty-two legs—three pairs of true legs on the front part of the body, and eight pairs of false legs, or pro-legs, as they are often called, on the hinder part.

There is one little family of saw-flies, however, which are quite unlike all the rest, for instead of having saws at the ends of their bodies, they have long boring instruments, very much like brad-awls. With these they bore deep holes in the trunks of fir-trees, in order to place their eggs at the bottom; and the grubs feed, when they hatch out, on the solid wood.

These insects are known as horn-tailed saw-flies, and one, which is very common in pine woods, is very large, sometimes measuring an inch and a half from the head to the tip of the tail, and very nearly three inches across the wings, while the boring tool is fully an inch long. It is a very handsome insect, and looks rather like a hornet, the head and thorax being deep glossy black and the hind body bright yellow, with a broad black belt round the middle. The feelers are also yellow, and the legs are partly yellow and partly black.

GALL-FLIES

Another group of the *Hymenoptera* consists of the gall-flies. These are all small insects, which lay their eggs in little holes which they bore in roots, twigs, and the ribs and nervures of leaves. In each hole, together with the egg, they place a tiny drop of an irritating liquid, which causes a swelling to take place, on the substance of which the little grub feeds. Sometimes these galls, as they are called, take most curious forms. The pretty red and white oak-apples of course you know; and no doubt, too, you have often found the hard, woody, marble-shaped galls which are so common on the twigs of the same tree. Then some galls look like bunches of currants, and some look like scales, and some look like pieces of sponge.

And if you cut one of them open you will find perhaps one little grub, or perhaps several, curled up inside them.

ICHNEUMON-FLIES

This is the last group of *Hymenoptera* that we can mention. These insects lay their eggs in the bodies of caterpillars or chrysalids, and sometimes in those of spiders, boring holes to receive them by means of their little sting-like ovipositors. Before long the eggs hatch, and the little grubs at once begin to feed upon the flesh of their victims. For some little time, strange to say, the unfortunate creature seems to suffer no pain, or even discomfort, but goes on feeding and growing just as before, although hundreds of hungry little grubs may be nibbling away inside it. Sooner or later, however, it dies; and then the little grubs spin cocoons and turn to chrysalids, out of which other little flies appear in due course, just like the parents.

Millions of caterpillars are destroyed by these little flies every year. Out of every hundred of those which do so much damage to our cabbages and cauliflowers, for example, at least ninety are sure to be "stung." Indeed, if it were not for ichneumon-flies we should find it quite impossible to grow any crops at all, for they would all be eaten up by caterpillars.

LEPIDOPTERA

Next we come to the butterflies and moths, which are called *Lepidoptera*, or scale-winged insects, because their wings are covered with thousands upon thousands of tiny scales. If you catch a butterfly, a kind of mealy dust comes off upon your fingers, and if you look at a little of this dust through a microscope, you find that it consists simply of little scales, of all sorts of shapes. Some are like battledores, and some like masons' trowels, and they are nearly always most beautifully sculptured and chiseled. These scales lie upon the wing in rows, which overlap one another like the slates on the roof of a house. And sometimes there are several millions on the wings of a single insect.

BUTTERFLIES

It is possible here, of course, to mention only a few of the most striking forms of butterflies, out of the many hundreds of species counted as North American. It may be said that these insects are much alike in general features all round the northern half of the globe, the same families being represented, so that, at first glance, European or Asiatic examples of such butterflies as the great yellow, black-striped swallowtail seem the same as American examples.

Among the handsomest of all northern butterflies is the purple emperor, which you may sometimes see flying round the tops of the tallest trees in large woods in the south of England. Far commoner, however, are the large, small, and green-veined whites, whose caterpillars are so destructive to cabbages; the scarlet admiral, with broad streaks of vermilion across its glossy black wings; the peacock, with its four eye-like blue spots on a russet ground; the tortoise-shells, mottled with yellow and brown and black; and the pretty little blues, which one may see in almost every meadow from the middle of May till the end of September. Then there are the brimstone, with its pale yellow wings, which with the blues dance along the roadways in little whirling companies all summer; the meadow-brown and the large heath, to be seen in thousands in every hayfield; the small heath and the small copper, even more plentiful still; the fritillaries, some of which live in woods, and some on downs, and some in marshy meadows; the pretty orange-tip, with pure white wings tipped with yellow; and the odd little skippers, which flit merrily about grassy banks in the warm sunshine in May and again in August—besides several others, which are so scarce or so local that hardly anybody ever sees them.

MOTHS

You can easily tell moths from butterflies by looking at their antennæ, or feelers, which have no knobs at the tips, as

those of butterflies have. Their number also is very great, and we can mention only a few of the most remarkable.

First among these is the splendid death's-head sphinx, or hawk, the largest of all the insects, which sometimes measures five inches from tip to tip of its wings when they are fully spread. It owes its name to the curious patch of light-brown hairs on its thorax, which looks just like a skull. The caterpillar is a huge yellowish creature, often nearly six inches long, with a blue horn at the end of its body, and seven blue stripes, edged with white, on either side. It lives in potato-fields, hiding underground by day and coming out at night to feed upon the leaves. And it is an odd fact that both the caterpillar and the perfect insect have the power of squeaking rather loudly. The moth appears in October.

The humming-bird hawk-moth flies by day, and you may often see it hovering over flowers in the garden, with its long trunk poked down into a blossom in order to suck up the sweet juices. As it does so it makes quite a loud humming noise with its wings, like the little bird from which it takes its name. And sometimes you may see a bee-hawk, which has transparent wings, hovering in front of rhododendron blossoms in just the same way.

The swifts fly between sunset and dark, and the largest of them is very curious indeed. For although it has glossy white wings, so that one can see it quite clearly in the dusk, it will suddenly disappear. The fact is that although its wings are white above they are yellowish brown below; so that when it suddenly settles, and folds them over its back, it at once becomes invisible.

The goat-moths are large, heavily built insects, with brownish-gray wings marked with a number of very short upright dark streaks. The caterpillar is a great reddish-brown creature with a broad chocolate band running down its back. It lives for three years in the trunks of various trees, and then spins a silken cocoon in which to turn to a chrysalis.

Tiger-moths have brown fore wings streaked with white, scarlet hind wings with bluish-black spots, and bright scarlet body. The caterpillar, which is very common in gardens, is

generally called the woolly bear, because of the long brown hairs which cover its body.

Very beautiful indeed are the burnets, which have dark-green front wings, with either five or six large red spots, and crimson hind wings, edged with black. You may often see them resting on flowers and grass-stems by the roadside in the hot sunshine. And in some parts of the country the cinnabar-moth is almost equally plentiful. You can recognize it at once by the crimson hind wings, and by the streak and the two spots of the same color on the front ones. The caterpillar, which is bright orange in color, with black rings round its body, feeds upon ragwort.

THE CURIOUS VAPORER

The vapor-moth is very common toward the end of summer, and even in London one may often see it dashing about in the hot sunshine with a strange jerky flight. But one only sees the male, which is a bright brownish-yellow insect measuring about an inch across the wings; for the female is much more like a grub than a perfect insect, and has wings so small that they are hardly visible. Of course she cannot fly; and her body is so big and clumsy that she cannot even walk. So she spends her life clinging to the outside of the cocoon in which she passed the chrysalis state, and covers it all over with her little round white eggs. And when she has laid the last of these she falls to the ground and dies.

Very handsome indeed is the emperor-moth, which has a big eye-like spot in the middle of each wing, something like those of the peacock-butterfly. But its caterpillar is even more beautiful still, for its body is of the loveliest grass-green color, sprinkled all over with little pink tubercles, each of which is enclosed in a ring of black, and has a tuft of glossy black hairs sprouting from it. This caterpillar feeds on bramble and heather, and when it reaches its full size it spins a light-brown cocoon among the leaves of its food-plant, and then turns to a chrysalis, from which the perfect moth hatches out in the following April.

Very often one finds caterpillars which look just like little bits of stick, and which walk in a most curious fashion by hunch-

ing up their backs into loops, and then stretching them out again, just as if they were measuring the ground. These caterpillars are called loopers, and they turn into moths with large broad wings and very slender bodies.

There are a great many kinds of these moths. One, called the swallowtail, may often be found hiding among ivy in July. It has large wings of a pale-yellow color, with little tails upon the hinder pair. Then there are the sulphur, a smaller insect with wings of a brighter yellow; the emeralds, of the most delicate green; the magpie, which has wings of the purest white, marked with streaks of orange and numbers of almost square black spots and blotches; and many others far too numerous to mention. If you ever shake a bush in summer-time you may see quite a dozen of them flying away to seek for some fresh hiding-place.

Then there is a large moth known as the puss, because it is colored rather like a brindled gray cat. The caterpillar is bright green, with a big hump in the middle of its body, and two long thread-like organs at the end of its tail, with which it will sometimes pretend to be able to sting you. But in reality it is perfectly harmless. You may often find it feeding on the leaves of willow-trees in August, and when it is fully fed it spins a hard, oval cocoon in a crack in the bark. And there are three smaller moths belonging to the same family, which are known as kittens!

Another very large group of moths is that of the *Noctuæ*, or night-fliers. But we so seldom see these unless we go out specially to look for them that we shall pass them by without further mention.

HOMOPTERA

The next order is that of the *Homoptera*, or same-winged insects, which are so called because their upper and lower wings are just alike.

The froghoppers all belong to this order. Do you know them? They are little brown or gray insects, sometimes marked or marbled with white, which carry their wings folded tentwise over their backs, and hop about with really wonderful activity.

It has been calculated that if a man of ordinary height could leap as well as a froghopper, in proportion to his greater size, he would be able to cover nearly a quarter of a mile at a single jump!

But if you do not know the froghoppers by sight you must at any rate know something of their grubs; for these are the creatures which cause the cuckoo-spit of which one sees so much during the early summer. Very often the weeds and long grass in a meadow, or by the roadside, are almost covered with the odd little masses of froth, so that one's feet get quite wet as one walks through the herbage. And in the middle of each mass is a fat little grub, which is sucking up the sap of the plant upon which it is resting, and pouring it out again in frothy bubbles.

The mischievous little aphides, or greenfly insects, also belong to this order. There are many different kinds, some of which do terrible damage to hops and corn and all sorts of cultivated plants. We have already mentioned these when describing the habits of ants, and you will recollect that they have sharp little beaks, which they thrust into young shoots and tender leaves in order to suck up the sap; and that as fast as they do so they pour it out again through two little tubes upon their backs in the form of the thin, sweet, and very sticky liquid which we call honeydew. You will remember, too, how fond ants are of this liquid, and how they "milk" the tiny insects just as if they were little cows.

So, you see, the aphides injure plants in two ways. First, they draw off all their sap, which is really their life-blood; and then they drop this sticky honeydew on to the leaves below, and choke up the little holes by means of which they breathe. And the worst of it is that these insects multiply so rapidly. Where there is one to-day there will be five and twenty to-morrow; and two days later there will be five and twenty times five and twenty; and two days later still there will be five and twenty times five and twenty times five and twenty! Indeed, if it were not for ladybirds and lacewing flies and one or two other insects which feed upon aphides, every green leaf would be destroyed by them in a few months' time.

A very curious fact about these insects is that as long as they

can find plenty of food they do not grow any wings. But as soon as the sap becomes scanty or thin, wings make their appearance, so that they can fly away and seek for better food elsewhere.

HETEROPTERA

The order of the *Homoptera*, or same-winged insects, is followed by that of the *Heteroptera*, or different-winged insects, in which that part of the wings nearest to the body is hard and leathery, while the rest is softer and thinner, and is generally almost transparent. Some of these live upon land, while others spend most of their lives in the water.

The curious bishop's-miters belong to the former group. There are a good many kinds, and some of them are very common. You may see them sitting upon flowers, or resting upon raspberries and blackberries in the sunshine. But although they are sometimes very pretty, we do not advise you to handle them, for they have the power of pouring out a liquid which will make your fingers smell very nasty indeed. And you should be most careful not to eat any fruit on which they have been resting, for they leave a horrible flavor behind them, which is even worse than the smell.

Among those which live in the water there are several most interesting insects. There are the water-striders, for example, which you can see running about on the surface of any pond, and which look like narrow-bodied long-legged spiders. But you will notice that they only have six legs, whereas true spiders always have eight. They skim about on the water by means of the middle and hinder limbs, the front pair being used in catching prey. And when they have caught a victim they suck its juices through their sharp little beaks.

Then there is the water-boatman, which always swims on its back. The reason why it does so is that when its body is in that position it is shaped just like a boat, while its long hind legs serve as a pair of oars. So the little insect really rows itself through the water. On a bright sunny day you may often see it resting on the surface of a pond, with its hind legs thrown for-

ward in readiness for a stroke. And if even your shadow falls upon it, or it feels the vibration of a heavy footstep, it will dive down in a moment to some hiding-place among the weeds.

If you ever catch a water-boatman, be careful how you handle it, or it will give your finger a very painful prick with its sharp beak.

The water-scorpion, too, is very curious. It is a flat, oval insect, of a dirty-brown color, which looks very much like a piece of dead leaf. It seems to know this quite well, for when it is hungry it always hides among dead leaves down at the bottom of the water, and keeps perfectly still. Then the other insects do not notice it, and as soon as one of them comes within reach it seizes it with its great jaw-like front legs, and plunges its beak into its body.

This insect is called the water-scorpion because it has a long spike at the end of its body, which looks something like a scorpion's sting. It is really a breathing-tube, however, the top of which is poked just above the surface of the water while the insect is lying at the bottom, so as to enable it to breathe quite easily.

APHANIPTERA

The order of the *Aphaniptera*, or unseen-winged insects, is a very small one, consisting only of the fleas. The name has been given to them because their wings are so tiny that, even with the microscope, they can hardly be seen at all.

There are a good many different kinds of fleas, all of which suck the blood of animals through their sharp little beaks. Some of them are able to leap to a really wonderful distance, by means of their powerful hind legs. And they are so wonderfully strong that if a man were equally powerful, in proportion to his greater size, he would easily be able to drag a wagon which a pair of cart-horses could scarcely move!

DIPTERA

The last order of insects is that of the *Diptera*, or two-winged flies, which seem to have two wings only instead of four. But if you look at them closely, you will see a pair of little knob-like

organs just where the hind wings ought to be. And these little organs, which we call balancers, are really the hind wings in a very much altered form.

Although they are so tiny, and look so useless, these balancers are used in some way during flight; for if they are damaged or lost the insect can no longer balance itself or direct its course in the air.

THE MOSQUITO

The mosquito is a troublesome insect which most of us know only too well; for there are very few of us who have not suffered from the wounds caused by its beak. Its life-history is very interesting. The eggs, which are shaped just like tiny skittles, are laid in the water, and the mother gnat fastens them cleverly together in such a way that they form a little boat, which floats on the surface. After a time a little door opens at the bottom of each egg, and a tiny grub tumbles out into the water. It is a very odd-looking little creature, with a very small head, a very big thorax, and a very long tail; and it mostly floats in the water with its head downward, and the tip of its tail resting just above the surface.

These grubs feed on the little scraps of decaying matter which are always floating in the water of the pond, and they wriggle their way about in the strangest manner, by first doubling up their bodies and then stretching them out, over and over again. After a time they throw off their skins and change to chrysalids, and out of this, a few days later, the perfect gnats make their appearance.

The mosquito is a gnat that has many relatives, some very troublesome, like the black fly. Some gnats have very big bushy feelers, just like big plumes. These are the males, and you need not be afraid of them, for they have no beaks and cannot bite.

CRANE-FLY AND DRONE-FLY

Then there is the crane-fly, whose balancers you can see quite easily. This insect lays its eggs in the ground, and the

grubs which hatch out from them are called leather-jackets, because their skins are so very tough. They feed upon the roots of grass, and sometimes do a great deal of mischief in pastures. Indeed, if it were not for such birds as the crow and meadow-lark, which destroy them in enormous numbers, we should find it almost impossible to grow any grass at all.

The drone-fly really does look rather like a bee; but it only has two wings instead of four, while its body is much more stoutly built, and it has no sting, so that you need not be in the least afraid of it. You may often see it sitting on flowers on sunny days in autumn, and it is especially fond of those of the ragwort.

The grub of this fly spends its whole life buried head downward in the mud at the bottom of some shallow pool—thick, black mud, which is largely made up of decaying leaves—and never comes out of it even to breathe. But at the end of its body it has a long tube, the tip of which rests just above the surface of the water, so that it can draw down as much air as it requires. And this tube is made something like a telescope, so that if a heavy fall of rain should raise the level of the water, all that the grub has to do is to push out another joint, when it can breathe just as easily as before. This grub is often known as the rat-tailed maggot.

HAWK-FLIES, ETC.

As you walk through a wood in summer, you may often see a black and yellow fly hovering in mid-air. If you move, it darts away so swiftly that the eye cannot follow its flight. But if you stop, and remain perfectly still, it will come back again in a moment or two, and hover just as before.

This is a hawk-fly, and it is very useful, for the mother insect always lays her eggs on twigs and leaves which are swarming with aphides. On these insects the grubs feed, so that as soon as they hatch out they find themselves surrounded with prey, and destroy the little insects in great numbers.

The house-fly and the bluebottle fly also belong to the order of the *Diptera*. They are not very pleasant insects, but while they are grubs they are really most useful, for they feed upon

all sorts of decaying substances. And another insect, called the flesh-fly, is even more useful still, for it is the parent of from sixteen to twenty thousand grubs: so that if even a single fly finds the carcass of a small animal and leaves her eggs upon it, the little ones that soon hatch out will devour it in a very short time. In a few days all these grubs turn into perfect flies, and in their turn become the parents of thousands of grubs: so that it has been said that three of these flies could devour a dead ox as fast as a lion could!

The last insect that we can mention is a brown and gray fly known as the warble. It is very troublesome indeed to cattle, for the mother fly lays her eggs upon their backs. Then as soon as the grubs hatch, they burrow underneath the skin of the poor animals, and form large swellings there, in which they spend the whole of their lives. When they are fully fed they wriggle out through a hole in the hide, drop to the ground, burrow into it, and turn to chrysalids, from which the perfect flies appear a few months later.

CHAPTER XXXIV

SPIDERS AND SCORPIONS

MOST people think that spiders are insects. But this is a very great mistake, for they are just about as unlike insects as they can possibly be.

Insects, for example, always have distinct heads. But spiders never do, for their heads are so sunk and lost in their chests that you cannot possibly tell where the one leaves off and the other begins. So that spiders have their bodies divided into two parts only instead of into three, as is always the case in the insects.

Then insects always have six legs; spiders always have eight. Insects have wings; spiders have none. Insects have feelers; spiders have none. Insects nearly always have a great many eyes, which are six-sided; spiders never have more than eight eyes, which are round. And while insects may have biting jaws, or sucking jaws, or a trunk, or a beak, spiders always have poison-fangs, which no insect ever possesses.

So you see that as far as the outside of their bodies is concerned, spiders are very different indeed from insects. And the differences inside the body are just as great. Insects have no hearts, the only blood-vessel in their bodies being one long tube which runs along the back; but spiders have quite a big heart, and a good many arteries as well. Insects have no lungs, but breathe by means of slender tubes which run to every part of the body; but spiders have quite big lungs, in which the blood is purified just as it is in our own. Insects have no brains, but only bunches of nerves in different parts of their bodies; but spiders have quite big brains. And besides this, while all insects which spin silk produce it through their mouths, spiders always do so by means of organs at the very end of the body. So that inside, as well as outside, there is hardly any respect in which spiders and insects really resemble one another.

The silk-organs of a spider are very wonderful indeed. Remember, in the first place, that the silk, as long as it remains in the body of the spider, is a liquid—a kind of thick gum, which is produced and stored up in six long narrow bags, or glands. Then if you look at the end of a spider's body through a good strong magnifying-glass—or, better still, through a microscope—you will see several little projections, which we call spinnerets. Now each of these spinnerets is covered with hundreds of tinier projections still, every one of which has an extremely small hole in the middle. And all these holes communicate, by means of very slender tubes, with one of the silk-glands.

So what a spider does when it wants to spin its line is to squeeze a little drop of silk into one of the spinnerets. It then just touches the object to which the line is to be fastened, and draws its body away. And as it does so a delicate thread comes out from every one of the projections on the spinneret; and all these threads unite together into one stout cord. That is why a spider's thread is so strong. It really consists of several hundred separate threads all firmly fastened together. And if the spider wants to spin a stronger line still, it can unite all the threads coming from several spinnerets into one, so as to make a very stout cord indeed.

Spiders use this silk for all sorts of different purposes. In the first place, they use it for snaring insects.

THE GARDEN-SPIDER

Let us take for an example, the web of the common garden-spider. It is to be seen in every garden, resting in the middle of its web; and you may always recognize it by the white cross upon its back. But I don't suppose that you have ever seen it spinning its net. For it always does so very early in the morning, generally beginning before sunrise, so that it may be quite ready for use as soon as the insects begin to fly.

First of all, the spider makes a kind of outer framework of very strong silken cords, and fastens it firmly in position by stout guy-ropes of the same material. Next, she carries a

thread right across the middle and fixes it down on either side. Then, starting from the center, she carries thread after thread to the margin, carefully testing the strength of each by giving it two or three smart pulls, and fastening it firmly down. When she has finished this part of her task, the web looks like a badly shaped wheel.

The next thing that the spider does is to spin a little silken platform in the middle of her web to sit upon. And as soon as she has done this she begins to spin the spiral thread. Beginning from the center, she goes round and round and round, fastening the thread down every time that it crosses one of the straight cords—the spokes, as it were, of the wheel—until at last the web is finished. Then she goes to the little platform in the middle, and there remains, upside down, waiting for an insect to blunder into her net.

By and by, perhaps, a bluebottle fly does so. Then she shakes the web violently for a few moments, so as to entangle it more thoroughly, rushes down upon it, seizes it, and plunges her fangs into its body. But if she catches a wasp or a bee she nearly always cuts it carefully out, drops it to the ground, and then patches up the hole in her web. For she knows perfectly well that wasps and bees can sting!

Would you like to know why it is that flies stick to the web as soon as they touch it? The microscope shows us. All the way along, the spiral thread is set with very tiny drops of liquid gum. So tiny are these drops indeed, that there are between eighty and ninety thousand of them in a large web! And would you like to know why it is that the spider does not stick to the web as the flies do? Well, the fact is that only the spiral thread is set with these little gummy drops, and that as the spider runs about over her web she is most careful to place her feet only on the straight threads, and never on the spiral line. Other spiders, however, snare their prey in quite a different way.

THE MARMIGNATTO

This small spider, found on our western plains, is remarkable for feeding on large insects, such as grasshoppers and

field-cricket, which it catches in an ingenious manner. It stretches a few silken threads across a narrow pathway, quite close to the ground, along which these insects are likely to pass, and lies in wait just opposite until a grasshopper or a cricket approaches. When it comes to the threads the insect is sure to get at least one of its feet entangled. Then it stops, and tries to shake itself free. The only result of its struggles, of course, is that its other feet become entangled too; and while it is struggling the marmignatto springs upon its back, fastens a silken thread to it, springs down again, and fastens the other end to a grass-stem close by. Over and over again it does this, and before very long the unfortunate insect is firmly fastened down by hundreds of threads, and is quite unable to break free, or even to move one of its legs. Then the spider leaps upon its back once more, plunges its fangs into its body, and proceeds to suck its blood.

HUNTING-SPIDERS

Perhaps you may have seen little hairy black spiders, with white markings upon the upper part of their bodies, running about in an odd jerky way on sunny fences and walls. These are called hunting-spiders, because they hunt their prey instead of snaring it. You may see them gradually creeping up to a fly, so slowly that they hardly seem to move, and then suddenly leaping upon it when they are about two inches away. Then spider and fly, locked in one another's embrace, go falling toward the ground together. But they never reach it, for wherever a hunting-spider goes it always trails a rope of silk behind it, and fastens it down at intervals. So when it springs from the fence it is brought up at once by its own thread, and swings in the air till its victim is dead. Then it just climbs up its thread, and so gets back to the fence.

BIRD-SPIDERS

These great spiders of the tropics hunt for prey in much the same way. Only instead of catching flies on walls they prowl

about the branches of trees in search of small birds, springing upon them when they are roosting at night, and killing them almost immediately by a smart bite from their venomous fangs. These spiders, of course, are very large. Indeed, the body of a full-grown bird-spider is as big as a man's fist, while its great hairy legs cover nearly a square foot of ground when they are fully spread out.

TRAP-DOOR SPIDERS

These famous spiders are found more or less commonly in all warm countries. They all live in tunnels in the ground, which they dig by means of their fangs; and as they do not want the situation of their nest to be discovered, they carry the earth away to a little distance as fast as they dig it up, and carefully hide it. Very often the hole which they dig in this way is eighteen inches or two feet deep. And at the bottom it always turns sideways for an inch or two, so that the general shape of the burrow is very much like that of a stocking.

This hole is always dug in the side of a bank, so that when there is a heavy fall of rain the water may run away without flooding it.

When the burrow is finished, the spider lines it throughout with two sheets of silk. The outer sheet, which comes next to the earth, is rather coarse in texture, and is quite waterproof, in order to keep the tunnel dry. The inner one is very much finer and softer, so that the little home may be as comfortable as possible.

As soon as the lining process is completed, the spider sets to work on the trap-door. This she makes in the cleverest manner possible. First she measures the doorway most carefully by the aid of her feelers. Then she spins a thin silken pad of exactly the same size and shape. This is sticky on the top, like the spiral thread of the web of the garden-spider: and she sprinkles it all over with very small scraps of earth. Upon this she fastens another silken pad, which she sprinkles with earth in the same way. And then comes another and then another, and so on till the door is sufficiently thick. Finally, she fastens it in position

by means of a hinge, which is also made of silk; and she always places this hinge on the upper side of the doorway, so that the door may fall down behind her by its own weight whenever she leaves the burrow. She is rather a lazy creature, you see, and does not want to have the trouble of shutting the door for herself! And if she left it open, every passer-by would find out where she had made her home.

The door always fits most wonderfully into its place, and the spider carefully covers the top with little bits of moss and small scraps of earth and stone, so as to make it exactly like the surface of the ground all round it. Indeed, unless one happens to see the spider push it open, it is almost impossible to find it.

When one of these spiders is in her burrow, she always fastens about half a dozen silken threads to the inner side of the door, carries them down to the bottom, and sits with one of her feet resting upon each. No one can then try to force her door open without her knowledge, and as soon as she feels the least pull upon the threads she rushes up the burrow, clings to the walls with her hind feet, seizes the door with her front ones, and pulls it downward with all her might. And if the door is forced open in spite of her efforts, she slips into a sort of side tunnel which she always makes near the top of her burrow, and stays there until the danger is past.

THE RAFT-SPIDER

There are several spiders which live on or in the water. One of these is the raft-spider, which is found in the fen districts of England. If you should happen to meet with it you can recognize it at once, for all round the upper part of its body is a narrow band of yellow, and inside this is a row of small white spots.

This spider is about an inch long, and owes its name to the fact that it actually makes a little raft on which to go out searching for water-insects. Collecting together a quantity of little bits of leaf and cut grass and reeds, it fastens them firmly together with silken threads, just as shipwrecked sailors might lash planks together with ropes in order to escape from a sinking vessel. In this way it makes a small floating platform, perhaps

a couple of inches in diameter. When the raft is finished, the spider gets upon it, pushes off from the shore, and allows the current to carry it along. By and by, perhaps, it catches sight of some water-insect floating at the surface, or of a drowning fly which has fallen into the stream. Then it leaves its raft, runs along over the surface of the water, seizes its victim, and carries it back to the raft to be devoured. And if it should be alarmed, or think itself in danger, it gets under the raft and clings to the lower surface, so that it cannot be seen from above.

THE WATER-SPIDER

More curious still is the water-spider, which actually makes its nest under water. This spider, which is almost black in color, and has a very hairy body and legs, is common in ponds and canals, and spends almost the whole of its life beneath the water. Its little silken nest is shaped like a thimble, with the mouth downward, and is placed among weeds, to which it is firmly fastened down by guy-ropes, also of silk. And when it is finished the spider fills it with air. She does this in a most curious manner. Rising to the surface, she turns upside down, pokes her long hind legs out of the water, and crosses the tips. Then she dives again, carrying down a big bubble of air between these hairy legs and her equally hairy body as she does so. She next gets exactly underneath the entrance to her nest and separates her legs. The result is, of course, that the air-bubble floats up and occupies the upper part. Another bubble is now brought down in the same way, and so the spider goes on, fetching bubble after bubble, until at last her little nest is completely filled with air. Then she gets inside it, and watches for the grubs of water-insects to swim by.

In this wonderful nest the spider lays her eggs and brings up her family. When the little ones have been hatched, of course, the air in the nest very soon becomes too impure to breathe. Then the little spiders cling tightly to the walls, while the mother gets outside and tilts the whole nest sideways, so that all the exhausted air floats up in one big bubble to the surface. Then she pulls the nest back into position, hurries up to the top of the

water and brings down a bubble of air, and then another, and so on until the nest is filled with air all over again.

If you ever catch one of these spiders, and keep it for awhile in a jar of water with a little piece of water-weed, you may see it spinning its wonderful nest, and filling it with air, perhaps half a dozen times a day.

GOSSAMERS

Before we leave the spiders altogether, we must tell you something about the wonderful little creatures called gossamers. These are really the young of a good many different kinds of spiders. It often happens, of course, that several families, with perhaps five or six hundred little ones in each, are all living quite close to one another. The result is that there is not sufficient food for them all. So they make up their minds to go out into the world and seek their fortunes; and this is how they do it.

Choosing a warm, sunny morning in the early part of the autumn, all the little spiders climb the nearest bush, and each one makes its way to the very tip of a leaf. Then, clinging firmly to its hold, it begins to pour out a very slender thread of silk from one of its spinnerets. You know that on warm, sunny days the air near the ground soon becomes heated and rises, as hot air always does; and in rising it carries up these delicate gossamer-threads, as they are called, with it. Still the little spiders hold on, and pour out their lines, till at last each has several feet of thread rising straight up into the air above it. Then suddenly they all let go, and are carried up into the air at the ends of their own threads. So they go on, up and up and up, till at last they meet a gentle breeze, which carries them along with it. So, perhaps, they travel for thirty, forty, or fifty miles, or even farther still. And when at last they make up their minds to descend, all that they have to do is to roll up the threads which have been supporting them, and down they come floating gently back to earth. One good name for them is ballooning spiders.

Haven't you sometimes found on a warm autumn morning that all the trees and bushes, and even the grass and low plants,

are quite covered with threads of silk? The next time you see such a sight look carefully, and you will find that on every thread a little baby spider is sitting. Then you may be quite sure that all these little spiders set out early in the morning to seek their fortunes, and that, borne up by their slender threads, they have traveled for many long miles through the air.

SCORPIONS

These formidable creatures are closely related to the spiders. They are found in all warm countries, with the exception of New Zealand, and may easily be known by two facts. In the first place, in front of the legs they have a pair of great, strong claws, which look very much like those of a crab. And in the second place, the last five joints of the body are narrowed into a long, slender tail, at the end of which is a claw-like sting. When they attack an enemy, or seize a victim, they grasp it with the claws, turn the tail over the back, and force the sting into its body. And the poison which is introduced into the wound is so powerful that the sting of a large scorpion is almost as severe as the bite of an adder.

During the daytime scorpions hide away under stones and logs, or in crevices in the ground, or perhaps under the loose bark of dead trees. But very soon after sunset they come out from their retreats and prowl about all night long in search of insects; and it is at such times that they invade camps and houses, get into shoes, etc., and persons get stung unless they are very careful.

CENTIPEDES AND MILLEPEDES

One can easily recognize centipedes by the great number of their feet. The name centipede, indeed, means hundred-footed. None of these creatures, however, have exactly a hundred limbs. Some only have fifteen pairs of legs; some have as many as one hundred and twenty-one pairs. But whether they be many or few, the number of pairs is always odd.

Another very curious fact about centipedes is that they have

no less than four pairs of jaws. But the fourth pair take the form of fangs, which are very stout and strong, and very much curved, while at their base, just inside the head, is a little bag of poison. In the northern centipedes, which are quite small, the fangs are not large enough, nor the poison sufficiently strong, to cause a serious wound. But some of the tropical species, which grow to the length of nearly a foot, are quite as venomous as the largest scorpions.

The food of these creatures consists chiefly of worms and insects. But the larger ones will kill lizards, and even mice, and have been known to prey upon victims actually larger than themselves.

The eggs of centipedes are laid in little clusters on the ground in some dark, damp nook, and when they have all been deposited the mother centipede coils herself round them, and there remains guarding them until they hatch.

Millepedes, in some ways, are very much like centipedes; but they only have two pairs of jaws instead of four, and they are nearly all vegetable-feeders. The long, smooth, and slender *Julus* millepedes are plentiful in every garden. And in tropical countries they sometimes grow to a length of six inches. Even the largest, however, are perfectly harmless, for they have no poison-fangs as the centipedes have, and the only way in which they ever attempt to defend themselves is by pouring out a small drop or two of a fluid which smells rather nasty, and no doubt protects them from the attacks of birds.

CHAPTER XXXV

CRUSTACEANS

WE now come to a very important class of animals, which includes the crabs, the lobsters, the shrimps, and the prawns. These creatures, together with the mollusks, are often called shell-fish, although the "shell" of a crab is not in the least like the shell of an oyster, for example, or like that of a whelk, or a snail. It is only a sort of crust upon the skin, made chiefly of carbonate of lime. That is why these animals are called *crustaceans*; and instead of growing, like true shells, this coat never increases in size at all.

But crabs and lobsters grow? Yes: but not as other animals do, a little every day. They only grow, as a rule, once a year; and they get a whole twelvemonth's growth into about two days!

When, in warm weather, the proper time approaches, they hide away in some crevice among the rocks, where none of their enemies are likely to find them. This is because they are going to throw off their so-called shells; and they know that when these are gone they will be deprived of their natural armor, and of their weapons too, and so will be quite at the mercy even of foes much smaller than themselves. Then a very strange thing happens. Part of their flesh actually turns to water! Sometimes, if you happen to take up a crab in a fish-market, and shake it, you will hear water swishing about inside it. This is a "watery" crab, and is not good to eat; for it was just about to change its "shell" when it was caught. A good deal of its flesh has actually turned to water.

Now this always happens a few days before the "shell" is thrown off; and the animal wriggles and twists about inside it, in order to loosen the attachments which bind it to its body. It also rubs its feelers against its legs, and its legs against one another, in order to loosen their hard coverings in the same way. This goes on, perhaps, for three or four days. Then,

suddenly, the "shell" splits across, and the animal, with a tremendous effort, springs right out of it, while the "shell" closes up again, and looks just as it did before. One might really think that there were two crabs instead of only one.

For some little time the animal now lies perfectly still. It is exhausted by its efforts, and its muscles are so cramped that they feel quite hard to the touch. This cramp soon passes off, however; and then at once the animal begins to grow. It grows very fast. Indeed, you can almost *see* it grow, for a whole year's increase in size has to take place in about forty-eight hours. Then a fresh crust is gradually formed upon the skin, and two or three days later the animal is once more clad in a coat of mail, and is ready to leave its retreat and face its enemies. For a whole twelvemonth after this it grows no bigger. But at the end of that time the process is repeated, and so on, year after year, until at last the animal reaches its full size.

FORMS OF CRUSTACEANS

The bodies of the crustacean animals are made up of a number of rings, or segments, like those of the insects. But there are always twenty of these rings, instead of thirteen; six forming the head, while there are eight in the thorax and six in the hind body.

Then—again like the insects—crustaceans have feelers, or antennæ, upon their heads. You can see these very well indeed in a lobster or a shrimp. But instead of having one pair of these organs, as insects have, they always possess two pairs. And it is rather curious to find that at the base of the front pair there are two little organs which seem to be ears, specially formed for hearing in the water, while at the base of the second pair are two other little organs which seem to serve as a nose, specially made for smelling in the water.

And—once more like the insects—crustaceans have to pass through several different forms before they reach the perfect state. They are hatched in the first place from eggs, which the mother animal carries about with her for some little time

firmly fastened to the hairs of the swimmerets, which we find under the hind part of her body. You will often find a shrimp with quite a large bunch of these eggs; and if you look at them carefully with a good strong magnifying-glass, you will see that they are all glued down to hairs.

Inside each of these eggs an odd little creature is formed, which is called the nauplius. Sometimes it is hatched while still in that state, and swims about through the water. But in almost all the higher crustaceans a change takes place before it leaves the egg, and it appears at last in the form of a zoëa.

This is a kind of crustacean caterpillar, and a very odd little creature it is. A great naturalist once described it as an animal "with goggle eyes, a hawk's beak, a scorpion's tail, a rhinoceros' horn, and a body fringed with legs, yet hardly bigger than a grain of sand!" Certainly it does not look in the least like the crab, or lobster, or shrimp into which it is going, by and by, to turn. And it swims in the oddest way possible, by turning endless somersaults in the water!

These zoëas are sometimes found in immense shoals, the surface of the sea being quite thick with them for miles. And they are useful little creatures, for they feed on the tiny scraps of decaying matter which are always floating about in the sea, just as tadpoles and gnat-grubs do in ponds, thus helping to keep the water pure. But a very great number of them are devoured by whales. For when whalebone-whales are hungry, they swim with open mouths through a shoal of these little creatures, and then strain them out of the water by means of the whalebone fringe which hangs down from the upper jaw.

After a time the zoëa throws off its skin and appears in quite a different form. It is now called a megalopa, or big-eyed creature, because it has very large eyes, which are usually set on foot-stalks, and project to quite a long distance from the sides of the head. And as the zoëa is a kind of crustacean caterpillar, so the megalopa is a kind of crustacean chrysalis. It generally has a long, slender body, made up of several joints. And it swims by flapping this to and fro in the water.

CRABS

First among the crustaceans come the crabs, of which there are a great many different kinds. They are distinguished by having the tail tucked under the body, and firmly soldered, so to speak, to the "shell" on either side.

You can find several kinds of these creatures by hunting among the rocks on the sea-shore when the tide is out. There is the common shore-crab, for example, which is green in color. It is generally to be found hiding under masses of growing seaweed. But sometimes you may see it prowling about in search of prey. It is wonderfully active, and will even pounce upon the sandhoppers as they go skipping about, just as a hunting-spider will pounce upon flies, seldom or never missing its aim. It will catch flies, too, leaping upon them when they settle, and shutting them up, as it were, in a kind of cage formed by its legs. Then it pokes one claw carefully into this cage, seizes the prisoners, pulls them to pieces, and pokes the fragments into its mouth.

Swimming about in the pools, too, you may often find a fiddler-crab, which is so called because its movements in the water rather remind one of a man who is playing the violin. You will find that its hind legs are very much flattened, and are fringed with stiff hairs, so that they may be used as oars. In fact, the animal rows itself through the water. Both these crabs, sad to say, are cannibals, and are always ready to attack and devour their own kind.

Then there is the edible crab, or blue crab, which is common on many parts of our coasts. The edible crab of Europe is somewhat different. You are not likely to meet with the larger examples, which live in deeper water. But even the smaller ones can give a very sharp nip with their great claws, and you will find it as well to be very careful in handling them. The best plan is to seize them with the thumb and finger just behind these claws, then they are perfectly harmless. The larger crabs, which sometimes weigh as much as twelve pounds, are extremely powerful, and in more than one case a man has

been killed by them, having been seized by the wrist as he was groping among the rocks, and held in a grip from which he could not break away until he was drowned by the rising tide.

These crabs are captured by means of crab-pots, made of basketwork, which have the entrance so formed that while the crabs can easily enter, they cannot possibly get out again. These pots are baited with pieces of fresh fish, and are then weighted with stones, and lowered to the bottom of the sea among the rocks, at a depth of from three to about twenty fathoms. They are also caught on lines baited with meat. No hook is needed, for the crab clings to the meat till it reaches the surface of the water, when it must be flung into the boat or somehow captured quickly, before it has time to let go and sink.

Some crabs live on dry land, sometimes at a distance of two or three miles from the sea, which they only visit at intervals. Among these are the famous calling-crabs, found in many of the warmer parts of the world. These crabs obtain their name from the fact that one of the great claws of the male is very much larger than the other. So big is it, indeed, that it has to be held aloft over the body when the animal is running, in order to prevent it from losing its balance and toppling over. And as soon as the crab begins to move this huge claw is jerked up and down, just as if the creature were "calling," or beckoning, to its companions. The calling-crabs live in burrows in the sand, which are often placed as close to one another as those in a rabbit-warren.

HERMIT-CRABS

Next we come to those small, curious creatures known as hermit-crabs, which form a kind of connecting link between the crabs and the lobsters, for their tails, instead of being firmly so'dered down underneath their bodies, are quite free.

But the odd thing about these animals is that their tails have no shelly covering. The front part of the body is protected by a coat of mail, just as it is in all the other crabs; but the hind part is quite bare and soft. The consequence is that a

hermit-crab is always very nervous indeed about his tail. He is dreadfully afraid that one of his many enemies may creep up behind, and bite it when he is not looking. So he always tucks it away in an empty shell like that of a whelk or a sea-snail, which he drags about with him wherever he goes!

You may often find these curious crabs by hunting for them in the pools among the rocks at low water. The crab always sits just inside the entrance of the shell, which he closes and guards with one of his great claws. And if you try to pull him out, you will find that you are quite unable to do so, for he has a pair of strong pincers at the end of his body, by which he holds the shell so firmly that you can tear him in two without forcing him to loose his grip.

Sometimes you will find that a sea-anemone has fastened itself to the edge of a shell in which a hermit-crab is living. This is a great advantage to the crab; for while there are many fishes which would be quite ready to crunch him up, shell and all, no fish will ever meddle with a sea-anemone. So as long as the anemone remains on his shell he is perfectly safe.

And this plan is also a great advantage to the anemone, which is sure to get plenty of food without any trouble. For when the crab finds the dead body of some small creature, and begins to pull it to pieces, a quantity of small fragments is sure to float upward in the water. And the anemone catches them with its spreading tentacles and feeds upon them.

THE ROBBER-CRAB

One of the most extraordinary crustaceans is this, which is found in many of the islands in the Indian Ocean. It is like the hermit-crabs in some ways, but the tail is covered with shelly plates, just like the rest of the body; and instead of living in shells in the sea, it lives in deep burrows on dry land.

But the oddest thing of all with regard to this crab is its food. What do you think it feeds upon? Cocoanuts! That seems impossible, doesn't it? One would imagine that the crab could never get the nuts open. But it manages in this way: First of all, it pulls away the fibers from that end of the nut at which the

three eyeholes are situated. With one of its stout claws it then hammers away at one of these till it breaks its way through. And finally, after allowing the milk to run away, it pokes its hind claws, which are very slender indeed, through the opening and picks out the white fleshy part of the nut a little piece at a time.

It is said, too, that this crab sometimes opens a nut by poking the smaller joint of one of its claws into the hole, and then striking it over and over again upon a big stone.

The burrow of the robber-crab is rather a deep one, and is nearly always situated beneath the roots of a tree. And at the end of the burrow is a large chamber, in which the crab piles up a quantity of cocoanut fiber to serve as a bed.

LOBSTERS

Of course you know the lobster very well by sight; and perhaps you know that until it is boiled it is black, not red. But do you know how it swims? If so, you know that it has two different ways of swimming. When it is not in a hurry it swims slowly forward by means of its swimmerets, of which it has five pairs under the hinder part of its body. But if it is startled or alarmed it swims swiftly backward by means of its tail.

If you look at a lobster's tail, you will see that it is very broad and flat, and that on either side of it are two plates, which are quite as flat, and, if anything, are rather broader. So, when these are spread, the tail looks like a fan. And the animal swims by first stretching out its body almost straight, and then doubling it suddenly with all its force. As it does so, the tail and the tail-plates spread out, and act very much like a broad oar. And the result is that the lobster darts swiftly backward through the water. Shrimps and prawns swim in exactly the same way.

Lobsters are very quarrelsome creatures, and are constantly fighting; and it very often happens that in these battles they pull off one another's limbs. They seem to feel very little pain, however, from such an injury, and before very long new legs begin to grow in place of the old ones, so that in course of time the wounded creatures are as perfect as ever.

Sometimes lobsters will throw off their limbs when they are not attacked at all. They do so, for example, if they are suddenly frightened; and it is said that if a heavy gun is fired near the surface of the water, every lobster for a long way round will shed its great claws in alarm.

You will notice, on looking at a lobster, that one of the great claws is a good deal smaller than the other; and sometimes people think that this is a new claw which is growing in place of one that has been lost, and that it has not yet reached its full size. This, however, is a mistake, for one of the claws is always much bigger than the other; and the reason is that they are used for different purposes. The larger claw is intended as a weapon, and with this the lobster fights. But the smaller one is chiefly employed as a kind of anchor, by means of which the animal can cling to the weeds or rocks at the bottom of the sea.

Lobsters are caught in pots made of basketwork, just as crabs are. But they are not nearly so dainty as crabs, and do not mind whether the bait is fresh or putrid. They are always very much attracted, too, by any object that glitters, and many a lobster has been lured to its death merely by one or two oyster-shells hung up inside the pot in such a manner as to show the shining pearly interior.

CRAYFISH

The crayfish is a kind of fresh-water lobster, which is found commonly in many parts of the world, and numerous in the central and southern parts of the United States. Most species hide all day long under the projecting edges of big stones, or in holes in the bank, only coming out after nightfall to search for food. The British crayfish is said to be particularly fond of the deserted burrow of a water-vole, and as it sits inside it always guards the entrance with its great claws, striking fiercely at any enemy which may be bold enough to come within reach.

One, at least, of the American kinds sinks its own burrows, in the form of round holes in the soil of damp meadows. These holes go down to water, which the animal cannot live long away from; and a part of the soil dug out is piled about the mouth of

the hole in a little tower or chimney, sometimes several inches high.

In Europe crayfish are eaten and regarded as a delicacy when properly cooked; and there is no reason why the American ones should not be equally good, but they are rarely if ever used as food by us. The flesh tastes like that of the lobster, but is more tender.

SHRIMPS AND PRAWNS

These are really only tiny lobsters, and if you examine them carefully you will find that their bodies are made in exactly the same way. They swim, too, by means of their tails, and dart about so swiftly that it is almost impossible to follow their movements. You may often find them in numbers in the pools which are left among the rocks by the retreating tide. But as they are almost colorless until they are boiled, it is very difficult to see them, and they look just like shadows darting to and fro in the water.

You can easily tell a prawn from a shrimp, for the beak which projects in front of its head is covered with sharp points, which are almost exactly like the teeth of a saw. It feeds upon the bodies of the various small creatures which die by millions every day. In this way it helps to keep the water of the sea pure. It feeds in a curious way, tearing off tiny scraps of flesh with the little pincers at the tips of the second pair of legs, and poking them into its mouth one after another. The sides of these limbs are covered with hairs, so that they form little brushes; and with these the prawn carefully cleans its body and limbs, rubbing off every little speck of dirt which may happen to cling to them.

SANDHOPPERS

You can hardly walk along a sand shore when the tide is rising without seeing sandhoppers leaping and twisting about in thousands. If you turn over a bunch of seaweed which has been flung up by the waves just above high-water mark, you are al-

most sure to find forty or fifty of these odd little creatures hiding under it. In some ways they are rather like shrimps. But they differ from them in having their eyes set on the head itself, instead of on little foot-stalks projecting from it. And they have no carapace, or shelly shield, covering the middle part of the body.

How do these creatures hop? By first doubling up their bodies, and then straightening them out again with a kind of jerk. It is exactly opposite, in fact, to the way in which shrimps and lobsters swim.

Sandhoppers do not follow the retreating tide, but bury themselves in the sand very soon after the waves have ceased to break over them. Even when the surface of the sand is quite dry you can find their burrows by stamping with your foot, when a number of little round holes will suddenly open all round you.

These creatures have wonderfully sharp little teeth, and if you allowed a swarm of them to rest for a little while on your handkerchief you would most likely find that it was full of tiny holes when you took it up. They will eat almost anything, either animal or vegetable, and are quite as useful as the shrimps and prawns in helping to keep the sea-water pure. But they have a great many enemies, for sea-birds, land-birds, crabs, and all sorts of other creatures, destroy them literally in millions.

THE FRESH-WATER SHRIMP

This shrimp is very much like the sandhopper in some ways. You may find it in numbers in almost any small stream or rivulet. It hides under stones, or in little crevices in the bank, darting out now and then to seize one of the tiny creatures upon which it feeds, and then hurrying back with it to its retreat. When it is in the water it travels along by a series of jerks; sometimes swimming with its back uppermost, and sometimes on one side. But if it is placed on dry ground it is perfectly helpless, for its legs are not nearly strong enough to carry it, and the only result of its struggles is to turn it round and round in a screw-like manner without forcing it forward at all.

WOODLICE

These odd little creatures are really crustaceans, although they belong to quite a different group from that about which you have just been reading. They simply swarm in all damp places. Under logs, in heaps of decaying leaves, and under the bark of dead trees, they are always extremely plentiful, and you may also find them in hundreds in cellars and outhouses. There are several different kinds, one of which rolls itself up into a ball when it is touched or alarmed. This is called the pill-woodlouse, or pill-armadillo. Another one is remarkable for the fact that the mother carries her little ones about with her in a pouch underneath her body for some little time after they are born.

BARNACLES

You would hardly think that barnacles were crustaceans, would you? Yet they are; though certainly they are very unlike any of those about which we have been telling. You can find them in countless thousands upon the rocks which are left bare by the tide at low water, and very often the hulls of ships are so covered with them that the vessels have to be taken into dry dock and thoroughly cleaned before they are fit to start upon a voyage.

These animals fasten themselves down to their hold by a kind of foot-stalk, which is firmly attached by a very strong cement. The upper part of the body becomes covered with a shell, consisting of several pieces, or valves; and between these, six odd little limbs can be poked out at will. These limbs are very hairy, and are always waving about, so as to sweep into the mouth any tiny scraps of food which may be floating in the water.

There are a great many kinds of barnacles, some of which look very much like acorns, and grow to a considerable size. These are known as acorn-barnacles. And there is another, shaped rather like a piece of round tube, which burrows into the skin of whales, in which it spends all the remainder of its

life! Sometimes it bores its way down so far that it actually reaches the blubber.

The young of these strange creatures pass through several transformations, just like those of the lobster and the crab. First, there is a nauplius, then a zoea, and then a megalopa, all of which swim freely about in the water, never fastening themselves down until they are ready to pass into the perfect form.

CHAPTER XXXVI

SEA-URCHINS, STARFISHES, AND SEA-CUCUMBERS

NEXT in order to the crustaceans comes a group of animals which live in the sea, and which are known as echinoderms, which simply means spiny-skins. This group includes the sea-urchins, the starfishes, and the sea-cucumbers.

SEA-URCHINS

You can find a good many of these creatures when you go to the seaside, by hunting about on the beach at low water. In some places on rocky coasts sea-urchins are very common. Sometimes they are known as sea-eggs, and in many countries they are actually boiled and eaten as food, just as we eat the eggs of fowls and ducks. And their shells are so thickly covered with spines that they look just like little hedgehogs which have rolled themselves up into balls.

When the animal is alive it can move these spines at will, each of them being fastened to the shell by a ball-and-socket joint, just like those which we described to you when we were telling about the vertebræ of the snakes. But after it has been dead for a few days they are nearly always knocked off by the action of the waves, so that the shell is left quite smooth and bare.

By means of these spines a sea-urchin can bury itself in the sand at the bottom of the sea in a very short time, only just a little funnel-shaped pit being left to show where it is hiding. And in some of the larger kinds they are really formidable weapons, for they grow to a length of eight or ten inches, and are so sharp and strong that they can actually pierce the sole of a stout shoe. Besides this, they have poison-glands connected with them, so that they can easily inflict a really serious wound.

In the shell of a sea-urchin are a number of little holes, through which the animal pokes out most curious sucker-like

feet when it wants to climb about over the rocks. By means of the suckers on the upper part of the shell it often clings to small stones, which it sometimes gathers up in such numbers as to conceal itself entirely from sight.

Just inside the mouth of the urchin are five very large chisel-like teeth. These are formed just like the front teeth of the rodent animals, and grow as fast as they are worn away.

Sea-urchins are not numerous on the Atlantic shores of North America, because these shores are not rocky except in the cold north. One small flat kind, however, occurs in the deep waters off this coast, and its cases are often cast up on the beaches and are called sand-dollars. On the Pacific coast, however, sea-urchins are common and well known; and the Indians of the northwest coast boil them and eat them greedily.

STARFISHES

More plentiful on both coasts, and extremely numerous and harmful in all the bays and sounds from Florida to Maine, are the starfishes, or fivefingers, as the oystermen call them. But although they are so abundant, very few people seem to know what curious creatures they are.

The starfish has hundreds of little sucker-like feet, just like those of the sea-urchin. You cannot see these, as a rule, because the starfish keeps them tucked away inside its skin. But when it wants to use them it can poke them out in a moment.

If you want to look at these odd little feet, the best way to do so is to take a live starfish, put it at the bottom of a pool of sea-water, and then wait patiently for ten minutes or a quarter of an hour. By the end of that time you are almost sure to see that the animal is slowly moving. Then snatch it out of the water, turn it upside down, and you will see hundreds of little white objects waving about on the lower surface of its body. These are its feet, and if you look at them through a good strong magnifying-glass, you will see that they are shaped just like wine-glasses, each having a kind of fleshy cup at the end of a slender stem. And at the end of the cup is the sucker.

In the very middle of the lower part of the body of a starfish is its mouth. This is generally rather large, for the animal feeds chiefly on shell-bearing animals which it swallows whole, shells and all. Then, when it has digested the bodies of its victims, it turns their empty shells out again through its mouth. That is an odd way of feeding, isn't it? But sometimes it feeds in an odder way still, for when it finds a creature which is too big to be swallowed, it will actually turn its own digestive organs out of its mouth, wrap them round its victim, hold them there until it is digested, and then drag them in again and go off to look for another victim!

Starfishes eat a great many oysters in this way. So many do they destroy, indeed, that they are the very worst foes with which oyster-fishers have to deal, and the damage done by them in one single oyster-bed on the coast of North America is estimated at no less than fifty thousand dollars every year.

There are a great many different kinds of starfishes. One, for example, has twelve rays instead of five, and looks very much like a live sunflower. This is called the sun-star. Another has its five rays all joined together by webbing, very much like the toes on a duck's foot, and is known as the bird's-foot star. It is a very handsome creature, for while the greater part of its body is bright yellow, it has a broad band of crimson running all the way round the outer margin, and another stripe of the same color down the outer edges of each ray, while the membrane between them is fringed with yellow hairs. But you are not very likely to find it, for it lives in rather deep water, and is hardly ever caught except by means of that useful net which is called a dredge.

Odder by far than any of these, however, are the brittle-stars, which owe their name to their extraordinary habit of breaking themselves to pieces! They nearly always do this if they are touched or alarmed. In fact, they are so ready to do so that it is very difficult indeed to obtain a perfect brittle-star for a museum. The creature just gives a kind of shudder, and its five rays all drop off and break up into little pieces, all that is left of the animal being just the central disk. But it does not appear to suffer any pain, and loses hardly any blood.

And before very long new rays grow in the place of the old ones, so that in a few weeks' time the starfish is just as perfect as ever!

The brittle-stars have five very long and very slender rays, which are generally fringed on either side with yellow hairs. And these rays are hardly ever still, but twist and writhe and curl about so actively that they really look almost like so many centipedes! It is by no means so numerous as the fivefinger, and is so easily broken that it is hard to find a whole one on the beach.

Very curious, too, is the basket-star, which at first sight does not look like a starfish at all. The reason is that, close to its body, each of the five rays divides into two. Then each of the branches divides into two again, and each of those into two more, and so on over and over again, till sometimes there are more than eighty thousand little arms altogether!

The basket-star catches its prey by means of these wonderful rays, which it wraps all round it in the form of a circular basket. It is not at all a common creature, and is only found in deep water.

But perhaps the oddest of all these creatures is the rosy feather-star, which actually grows on a stalk while it is young, and looks just like a flower with its petals spread. The stalk, which is fastened down to a rock at the bottom of the sea, is made up of a great number of tiny joints, and grows longer and longer. And when it reaches its full length the animal breaks itself free and swims away, leaving the stem behind.

The rosy feather-star lives in rather deep water, from which it is sometimes brought up by means of the dredge. It can crawl about on the ground by means of its sucker-like feet, and can swim through the water with some little speed. And very often, to save itself trouble, it will cling by means of its rays to a piece of floating wood, and allow itself to be carried for long distances by the waves.

In Great Britain these may often be found near shore, but the American feather-stars all live in very deep water. They are all that remain of a large class of such animals which abounded in the very ancient seas, whose fossil remains are called stone-lilies.

SEA-CUCUMBERS

These are really relations of the starfishes, although they do not look in the least like them; for they closely resemble the vegetable after which they are named. In front of the slit at one end of the body, however, which serves as a mouth, there is a feathery tuft. This consists of delicate little tentacles, or feelers, by means of which the animal fishes for its food, and which can be drawn back inside the body when it is not hungry. And if it were not for this tuft one really might almost mistake the animal for a grayish-white cucumber.

We saw just now that the brittle-star breaks off its own rays at the slightest alarm. But the sea-cucumber, in this way, is even odder still, for if it eats anything which disagrees with it, as it sometimes does, it turns all its digestive organs out of its mouth, cuts them off, and allows them to float away! Then for three or four months it is very little else than a bag of empty skin, with just a slit at one end and a tuft in front of it. But at the end of that time new digestive organs begin to grow in the place of the old ones, and very soon the sea-cucumber is as perfect as ever!

Isn't that a remarkable way of curing indigestion?

Some of the sea-cucumbers grow to a very great size. One indeed, when fully grown, is nearly six feet long. And in China they are largely used as food, under the name of tre-pang, and are looked upon as a great dainty.

CHAPTER XXXVII

MOLLUSKS

THE class of the mollusks is a very large one, for at least fifty thousand different kinds of these creatures are already known, while new ones are constantly being discovered. They may be described as soft-bodied, boneless animals, which are enclosed in a tough muscular skin called the mantle. And they are divided into five orders, the first of which includes the singular creatures known as squids, or cuttles.

You may sometimes find these animals hiding in the pools which are left among the rocks when the tide goes out; and you can recognize them at once by the long, fleshy tentacles, or arms, which spring from the upper part of the head. Some of them have ten of these arms, and are called decapods; the rest have only eight and are known as octopods. And the lower surface of each arm is furnished with a row of circular suckers, the grip of which is so powerful that the tentacle may even be torn in two without causing it to release its hold. Indeed, if quite a small cuttle were to seize you with one of its arms, you would not find it at all easy to make it let go again without killing it.

The cuttles employ these suckers for two purposes. In the first place, they use them in walking. When a cuttle is crawling along at the bottom of the sea it pushes one or two tentacles forward, takes firm hold of a rock or a large stone with the suckers underneath them, pulls up the body, and then thrusts them forward again. And in the second place, they use them in catching their prey. Quite large victims are often seized by cuttles, and when once the deadly suckers have fastened upon them there is no hope of escape. In spite of their struggles one tentacle after another comes closing in, till they are completely surrounded by the long, slimy arms, soft almost as jelly, yet strong as steel. Then they are pushed down against the sharp, strong beak, by which they are quickly torn in pieces.

On the upper part of the head of the cuttle there is another



LIFE ON THE SEA-BOTTOM.

- | | | | | | |
|------------------|-------------------------|------------------------------|----------------------------|------------------|--------------------|
| 1. Stick-leaves. | 2. Carp. | 3. 4. 5. 6. 7. Sea Anemones. | 8. Starfish. | 9. Prawn. | 10. Fiddler Crab. |
| 11. Sea-horses. | 12. Serpula Worm. | 13. Edible Mussels. | 14. Hermit Crab. | 15. Hermit Crab. | 16. Whisk & Shell. |
| 17. Sea-urchins. | 18. Polyzoon (Flustra). | 19. Rock Crab. | 20. Corallines (Gorgonia). | | |

curious organ known as the siphon, which consists of two tubes lying side by side together, like the barrels of a double-barreled gun. This organ is used in three different ways.

First, it is used in breathing. The cuttles, like the fishes, breathe water, by means of gills. These gills lie inside the head, and the water passes down to them through one of the siphon-tubes, and then out again through the other.

Next, it is used in swimming. When cuttles are not in a hurry they crawl along by means of their long tentacles, as we told you just now. But if they are startled, or alarmed in any way, they fold all their tentacles together in a straight line, fill both the siphon-tubes with water, and then squirt it out again as hard as they possibly can. The result is, of course, that they are driven rapidly backward by the recoil, just like the dragon-fly grub, of which we have read.

But the third use of the siphon-tubes is the most curious. If you discover a small cuttle hiding in a rock-pool, you will very likely find that the water all round it suddenly grows dark as night, just as if a quantity of ink had been poured into it. The fact is this. Inside its body the cuttle has a bag filled with a quantity of a deep-black liquid called sepia. This bag is surrounded by strong bands of muscle, and opens into the siphon-tubes. So, you see, when the animal suddenly contracts the muscular bands, the sepia is squirted out through the siphon into the water, which is immediately darkened for some little distance all round. And under cover of the darkness the animal escapes.

The eggs of the cuttle are laid in a very curious way, for they are fastened by little stalks to a stem of seaweed, so that they look very much like a bunch of grapes. Fishermen, indeed, nearly always speak of them as "sea-grapes."

The cuttles which are found in the British seas are always quite small. But in some parts of the ocean these creatures grow to a giant size. Fragments of the tentacles of an enormous cuttle, for instance, have been found lying on the coast of Newfoundland; and by careful calculation it was shown that if the animal to which they belonged had stretched them out at right angles to its body, they would actually have measured more than eighty feet from tip to tip!

These huge creatures seem to form the principal food of the spermaceti-whale.

THE CHAMBERED NAUTILUS

This animal is a near relation of the cuttles. It lives in a shell, which cannot increase in size. The mollusk itself grows, however, and soon becomes too big to live in its home; so it forms a second and larger compartment outside the first one. Time after time this happens, till at last the shell consists of about thirty-six chambers, only the outside one being inhabited by the nautilus.

This shell is often more than a foot in diameter. But if you were to see it when it is first taken out of the sea you would never think that it was a shell at all. Indeed it looks much more like a big shapeless lump of blubber, for the animal covers it entirely with its muscular mantle, so that the shell itself is completely concealed.

Very little is known of the habits of the chambered nautilus, for it lives at the bottom of the sea, at a depth of two or three hundred fathoms. It is found in various parts of the Indian and Pacific oceans.

GASTROPODS

A great many well-known creatures belong to this large group, first upon the list being the slugs. We need not describe these animals, but perhaps you will be surprised to hear that they have shells! These shells are very small, however, and are entirely covered over by the mantle, so that they cannot be seen unless the body is dissected.

Slugs have the most wonderful power of stretching out and drawing up their bodies. You may see one of these creatures crawling about on a damp evening, and measuring fully five inches in length. But at the slightest touch it begins to contract, and in a few seconds it is just a shapeless lump, scarcely half as long as it was before. The odd little tentacles are drawn back into the head, and the head is drawn back into the body so that

if you did not happen to know what it was you might easily mistake it for a pebble.

On the right-hand side of a slug's body, as it crawls along, you will notice a rather large and almost round hole. This is the entrance to the breathing-organs, which lie just behind the head and underneath the mantle.

During the daytime slugs remain in hiding, lying behind the loose bark of dead trees, or under logs and large stones, or in heaps of decaying leaves. And if the weather is very hot and dry they do not come out even at night, for they very soon die if they are deprived of moisture. But on warm, damp evenings they travel for long distances in search of food, which is almost entirely of a vegetable character. In Europe every gardener knows what injury they do to gardens there, but in America the slugs are practically harmless.

A good many different kinds of slugs are found in Great Britain. The largest of all is the great gray slug, which often grows to a length of more than six inches. Then the black slug is very common in many parts of the country. It is not always black, however, for one may often find examples which are brown, or yellow, or gray, or even white. The milky slug, which has a thick creamy slime, is plentiful everywhere. And sometimes one may dig up a very curious slug—testacella—which feeds on earthworms, and follows them down to the very bottom of their burrows. When the weather is cold, this slug makes a kind of cocoon of earth and slime, and lies fast asleep inside it, often for many months at a time.

SNAILS

In many ways snails are very much like slugs, but they have a shell large enough to contain the entire body when the animal withdraws inside it. Several hundred different kinds of snails are found in North America, and many more in other parts of the world, varying in size from that of a small pinhead to that of a big walnut. Some are exceedingly numerous, others so rare and singular in their living-places that they are highly prized by conchologists. All snails lay eggs, usually in damp

soil; and if you will turn over an old log in the woods in summer, you will be almost certain to find some of the minute shining globules. When winter draws near all the snails go into hiding, and they have a most curious way of closing the entrances to their shells by making little doors across them, composed partly of slime and partly of very small fragments of earth. This is in order to prevent the frosty air from getting in and killing them. But it would never do, of course, to keep all the air out, for in that case they would be unable to breathe. So they always leave a tiny hole in the middle of each door, through which just enough air can pass to prevent them from being suffocated.

Among the largest of all is the edible snail, which is largely used for food in many parts of Europe and is imported into the United States and pickled, to be eaten by those who like this delicacy.

Most of the gastropod mollusks, however, live in the water, some inhabiting ponds and streams, while others dwell in the sea.

In almost every brook and every ditch, for example, you may find water-snails of different kinds. Some are quite flat, and some are conical and pointed. Some are as large as land-snails, and some are so tiny that they are almost always overlooked. Most of them feed upon decaying leaves, and they have an odd way of traveling by floating upside down at the surface of the water, each with its broad fleshy "foot" expanded, so as to convert themselves into tiny boats. You may sometimes see quite a fleet of these little creatures being carried along by the stream. But if you throw a stone into the water they all sink down to the bottom at once, and do not resume their journey until many hours or even days afterward.

The eggs of this snail are laid in long jelly-like ribbons, which are generally fastened either to the stems and leaves of water-plants, or under the edges of large stones lying at the bottom of the stream. A very large number of gastropods live in the sea. One of the best known of these is the whelk, of which one reads in all books of English natural history. On almost every sandy and shingly beach, in Western Europe, one may find it lying about in hundreds; and even in large inland towns one often sees whelks for sale, both in fishmongers'

shops and on barrows at the corners of the streets. Its eggs are one of the curiosities of the sea-beach—small, yellowish-white objects about the size of peas, made of tough, parchment-like skin, and fastened together in bundles about as big as cricket-balls. You may often find these bundles on the shore in dozens; and most likely you will wonder how the whelk ever managed to lay a batch of eggs a good deal bigger than itself.

But the fact is that the eggs of the whelk are just like those of the frog. When they are first laid they are very tiny; but the tough skin of which they are made is very elastic, so that it will stretch almost like a piece of india-rubber. Besides this, it has the curious property of allowing water to soak in from the outside, but not to pass out again. So as soon as the eggs are dropped into the sea they begin to swell, and before very long they are quite twenty or thirty times as large as they were when they were first laid.

We do not have these whelks in North America, but we have a variety of small gastropods, whose shells are sometimes rough and coiled in a spiral form, sometimes round like land-snails, and of various sizes. One of them is the *purpura*, which has many ribs, and broad dark and light stripes running spirally. The *purpura* of the Mediterranean is famous for the purple dye obtained from its body; but our species yields such a dye also in small quantity. This was the dye anciently known as Tyrian purple. It is contained in a little bag behind the throat, which holds just one small drop of liquid, and no more. And if you were to see it you would never think that it was dye at all, for it looks only like rather yellowish water. But if it is squeezed out on a sheet of white paper, and laid in the sunshine, it very soon begins to change color. First it becomes green, then blue, and then purple. And it is really the dye which the ancient Romans valued so highly that no one who did not belong to the royal family was allowed to dress in purple raiment.

BORERS

In many parts of our eastern coast occur in great numbers two or three kinds of small, rough, spiral gastropods, called

borers by the fishermen, who hate them because of the great number of oysters they kill. Each of these spends its whole life in seeking and devouring other shell-bearing mullusks. It kills and eats these in a very curious way. Like all the gastropods, it possesses what we call a tooth-ribbon—that is, a narrow strip of very tough gristle in its mouth, set with row upon row of sharp, notched, flinty teeth. There are some times more than six thousand of these teeth, and although they are so small that they cannot be seen without the aid of a powerful microscope, they are nevertheless very formidable. For every tooth is hooked, with the points of the hook directed toward the throat.

The tooth-ribbon is used in this way: When a borer meets with a victim, it fastens itself to it by means of its fleshy, muscular “foot.” Then it bores a round hole through its shell, as neatly as if it had been pierced by a drill. And then it pokes the tooth-ribbon down into the body of the creature inside, and draws it back again. As it does so, of course the hooked teeth tear away little bits of the victim’s flesh. The borer swallows these, and then pokes down its tooth-ribbon once more. And so it goes on, over and over again, until the shell of its victim has been completely emptied, when it goes off to look for another.

PERIWINKLES

These are common on rocky parts of the coast, and you may find them crawling about on the weed-covered rocks in thousands when the tide is out. They have tooth-ribbons just like that of the borer, but they do not use them in the same way, for they feed only upon seaweeds. And they are remarkable for having the foot divided by a kind of groove, which runs right down the middle. When a periwinkle crawls, it moves first one side of this foot forward, and then the other side, so that although it has no legs it may really almost be said to walk.

THE COWRY

One of the prettiest of the gastropod shells, is that of the cowry, in some parts of Africa used as money. It would seem

strange to earn one's living just by picking up money on the sea-shore, wouldn't it? And perhaps you might think that every one who lived near those parts of the coast where cowries are found must be very well off. But then sixteen hundred of these shells are only worth about a quarter of a dollar, so that you would have to hunt for a very long while and stoop a great many times in order to obtain sufficient even to buy food. And it must be very awkward to have to carry several sacks of money when one goes out marketing! Many of them, however, are extremely beautiful.

LIMPETS

Commoner still are the limpets, which you may find in thousands clinging to the rocks that are left bare when the tide goes out. They fasten themselves down by means of the broad, fleshy foot, which acts as a big sucker. And so firmly do they hold that it is almost impossible to pull them away.

After a time, the edges of a limpet's shell cut a circular groove in the rock to which it clings, so that even the sea-birds cannot drive their beaks underneath and force it from its hold. And though, when the tide is up, the mollusk will wander to a distance of two or even three feet in search of food, it always seems to return to its resting-place before the retreating waves again leave the rock uncovered.

AMPHINEURANS

This order of mollusks contains the curious creatures which are known as chitons. These may be described as sea-armadillos, for they are covered with a kind of shelly armor, consisting of a series of plates, and can roll themselves up into balls, in order to protect themselves from the attacks of their enemies.

One of these mollusks is called the prickly chiton, because it is covered all over with sharp spines, like a hedgehog. It grows to a length of nearly six inches. But long before it reaches its full size the spines are rubbed off, so that a large example of

this creature is nearly always perfectly bare. The chitons live among muddy rocks at low-water mark, and are not common outside the tropics or in shallow water.

The order of the amphineurans is quite a small one, and so is that of the scaphopods, which consists only of the tooth-shells, which are very common on the sandy coasts of the Northern Pacific, and look rather like very tiny elephants' tusks. The Indians of the Puget Sound region used to string them as ornaments, and valued them highly.

BIVALVES

The order of the bivalves is a very large and important one. All these creatures have their shells made of two parts, or valves, which are fastened together by means of a hinge. They have no heads, and the mantle forms a kind of flap on either side of the body. They are found both in fresh and salt water. Every one knows the "fresh-water clams," or mussels, which abound in our lakes and rivers. In the central and southern parts of the United States they are exceedingly numerous and of many kinds, some rough, others smooth. All are lined with mother-of-pearl, and pretty buttons and other ornaments are made from them. Moreover, pearls are very frequently discovered inside their shells, and sometimes they are of great value.

THE PEARL-OYSTER

Pearls are obtained chiefly, however, from the pearl-oyster, which is found in warm seas in many parts of the world, the principal fisheries being in Ceylon, the Persian Gulf, the South Sea Islands, and off the northeast coast of Australia. They are deposited by the mantle, and it is most likely that they are really due to a grain of sand, which has lodged inside the shell and set up irritation. Indeed, it has been found that if small objects, such as tiny stones, are forced between the valves of one of these oysters, they become covered with layers of pearl in a very short time. The best mother-of-pearl is also obtained from the shells of the pearl-oyster.

OYSTERS

The ordinary oyster belongs to another family of bivalves, in which one part of the shell is a good deal larger than the other.

The early life of this mollusk is very curious. The spawn is known as spat, and is produced in enormous quantities. This spat looks at first like very fine gray dust, and remains for some little time within the shells of the parent. But one day in early summer the oyster opens its valves a little way, and squirts it out like a cloud into the water. For a few weeks the little oysters are able to swim, and they generally travel backward and forward with the tide. But after a while they attach themselves to some object at the bottom of the water, and there they remain without moving any more for the rest of their lives.

One would think that, since a family of oysters is so enormously large, these creatures must be the most plentiful mollusks in the sea. But by far the larger number are destroyed by other creatures before they are able to settle down; while even after that they have a great many enemies. We have already told you how mischievous starfishes are in the oyster-beds. Then borers and dog-whelks are almost equally troublesome, and besides these there is a curious kind of sponge, called the cliona, which burrows into the shells of the mollusk and gradually destroys them, sometimes actually causing them to fall to pieces.

BLACK MUSSELS

Two or three kinds of black mussels live in vast numbers on almost all coasts, clinging to rocks and submerged timber. The way in which a mussel fastens itself to its hold is very curious, for instead of turning the whole of the foot into a big sucker, as the limpet does, it spins a number of very strong threads from that part which lies nearest to the hinge; and every one of these threads is separately fastened to the support, so that the creature is moored down, as it were, by a kind of cable. These threads are known as the byssus, and hold so firmly that it is not at all

easy to pull them away. Some of these mussels are good to eat, but are not as much used in the United States as in Europe.

THE COCKLE

This is another very well-known bivalve. Its heart-shaped shells, covered with low ridges, you must know by sight. It is one of the burrowing mollusks, spending its life buried in sandy mud. It is especially common at the mouths of large rivers, where enormous quantities are collected to serve as human food. And its large muscular foot is not only used in digging, but also enables it to leap to a considerable height. It is to this family that the quahog or hard clam of our markets belongs.

RAZOR-SHELLS

These, too, are inhabitants of the mud, and if you want to find their burrows all that you have to do is to visit a patch of sandy mud when the tide is out, and stand quietly watching it. Before long you are sure to see a little jet of water spurt out of the mud to a height of three or four inches. Now this water has been squirted out of the siphon-tubes of a razor-shell, and if you walk to the spot, treading very carefully, you will find a tiny hole in the mud. This is the entrance to the burrow, and if you want to get the animal out, the best way to do so is to drop a little salt down the hole. For it is a very strange fact that although the razor cannot live in mud at the bottom of fresh water, it does not like pure salt at all, and is sure to come up to the surface and try to get rid of it. But if you fail to seize it at once it will retreat to the very bottom of its burrow, and no amount of salt will persuade it to come up again. The soft clam, which is sold in our markets in such enormous quantities, is a near relative of the razor.

THE PIDDOCK

One of the most wonderful of all the bivalves is the piddock, as it is a boring mollusk, living buried in the solid chalk or lime-

stone. If you should examine the rocks which are left bare at low water along the shore of the Mediterranean, or some other warm sea, you would often find that they are pierced by numbers of rather large round holes. These are the entrances to the burrows of piddocks; and if you could split the rock open you would find several of these creatures lying in their tunnels.

Sometimes, when they are boring, their burrows become choked up behind them with the material which they have scraped away. Then they just squirt out a jet of water from their siphon-tubes, and so wash the passage clear.

It is really owing to the work of the piddocks that chalk and limestone cliffs are so much cut away by the sea. The waves by themselves can do very little in this way. For when they wash up against the face of the cliff they leave the spores of seaweeds behind them; and these very soon grow and cover the whole surface with a mantle of living green, which almost entirely prevents the cliff from being worn away. But the piddocks drive their burrows into the rock just below the surface of the water, boring backward and forward till it is completely honeycombed by their tunnels, which only have just the thinnest of walls left between them. Then the sea washes into the burrows, and breaks these walls down, so that the whole foundation of the cliff is cut away. Very soon, of course, there is a landslip, and hundreds of tons of chalk or limestone, as the case may be, come falling down. Then the piddocks begin working again a little farther back, and the process is repeated; and so on over and over again.

On many parts of the south coast of England long stretches of rocks run ever so far out into the sea, and are only partly left bare at low water. Those rocks were once the bases of cliffs, which the piddocks and the waves together have cut away. And it even seems almost certain that the Strait of Dover was cut in this manner, and that if it had not been for the labors of the piddocks, carried on day after day for thousands upon thousands of years, Great Britain even now would not be an island, but would still form part of the continent of Europe, as we know that it did in ages long gone by!

THE TEREDO

There is a bivalve mollusk which burrows into submerged timber, such as the hulls of wooden ships, or the beams of piers and jetties. This is called the teredo, or ship-worm, and certainly it does look much more like a worm than a mollusk, for it has a cylinder-shaped body something like a foot in length, with a forked tail, while the shell only covers just a little part at one end. How it burrows into the wood nobody quite knows. It is generally supposed to do so by means of the foot. But in a very short time it will honeycomb a great beam of timber with its burrows, which it always lines with a kind of shelly deposit, weakening it to such a degree that at last it gives way beneath the slightest pressure. •

Like a great many other mollusks, the teredo passes through a kind of caterpillar stage before it reaches its perfect form. While it is in this condition it is able to swim freely about in the water, and looks rather like a very tiny hedgehog, being almost globular in shape, and covered all over with short projecting hairs. It is by means of the action of these hairs upon the water that it is able to swim.

CHAPTER XXXVIII

ANNELIDS AND CÖLENTERATES

THE important class of the annelids contains those creatures which we generally call worms. There are a great many of these, but we shall only be able to mention one or two.

THE COMMON EARTHWORM

This worm is really a most interesting as well as a most useful animal. The way in which it crawls is decidedly curious. On the lower part of every one of the rings of which its body is made up, with the sole exception of the head, are four pairs of short, stiff, little bristles, projecting outward from the skin. The worm really hitches itself along by means of these bristles. First it takes hold of the ground with those underneath the front rings, then it draws up its body and takes hold with those underneath the hind ones, and then it pushes its head forward and repeats the process; and so on, over and over again.

If you take a worm and pass it between your finger and thumb from the tail-end toward the head, you can feel these little bristles quite easily.

A worm does not often leave its burrow, however, but generally keeps the tip of its body just inside the entrance, so that it can retreat in a moment in case of danger.

Worms make their burrows in a very odd manner, for they actually eat their way down into the ground, swallowing mouthful after mouthful of earth until their bodies can contain no more. Meanwhile they have been absorbing nourishment from this soil; but presently they come up to the surface and pour out the mold which they have swallowed in the form of what we call a worm-cast, after which they go down again and swallow more, and so on until the burrow is sufficiently deep.

You will be surprised, we think, to hear how much earth is swallowed by the worms in this way. Just think of it. Every year, in every acre of agricultural land all over the country, worms bring up from below, on an average, and spread over the surface in the form of worm-casts, no less than fourteen tons of earth, or about seven large cart-loads!

This is why worms are such useful creatures. They are always, as it were, digging and plowing the soil. After a time the earth at the surface becomes exhausted. Nearly all the nourishment is sucked out of it by the roots of the plants. But the worms are always bringing up fresh, rich, unused soil from below, and spreading it over the surface in the form of what farmers call a top-dressing. They are doing, in fact, exactly what we do when we dig our gardens or plow our fields—burying the used-up soil that it may rest, and bringing up fresh mold to take its place.

But, besides turning the soil over, they manure it; for almost every night from early spring to late autumn worms are busy dragging down leaves into their burrows. With some of these leaves they line their tunnels, with some they close the entrances, and on some they feed. And most of them decay before very long and turn into leaf-mold, which is just about the very best manure that there is. So you see, the worms do not merely turn the soil over, they enrich it as well, and help very largely indeed to keep it in such a condition that plants can continue to grow in it.

THE LUGWORM

The similar lugworm lives in sandy mud on the sea-shore; and when the tide is out you may often see its casts in thousands. It is very largely used by fishermen as bait. When it is carefully washed it is really quite a handsome creature, for sometimes it is deep crimson in color, and sometimes dark green, while on its back are twenty-six little scarlet tufts, arranged in pairs, which are really the gills by which the worm breathes.

The burrows of the lugworm are not quite like those of the earthworm, for as its tunnels through the sand it pours out a kind of glue-like liquid, which very soon hardens and lines the walls, so as to form a kind of tube and prevent the sides from falling in.

THE TEREBELLA

This worm forms very much stronger tubes. It is common on many parts of our coasts. But it is not very easily found, for at the slightest alarm it retreats to the very bottom of its burrow, which nearly always runs under large stones and rocks.

The terebella makes its tube by means of the little feelers, or tentacles, which spring from the front part of its body. These have a most wonderful power of grasp, and one after another little grains of sand are seized by them, and carefully arranged in position. And when the tube is quite finished, the animal constructs a little tuft of sandy threads, so to speak, round the entrance, which you may often see in the pools left among the rocks by the retreating tide.

THE SEA-MOUSE

Looking far more like a hairy slug than a worm, the sea-mouse also belongs to the class of the annelids. You can easily find this creature by hunting in muddy pools among the rocks just above low-water mark; and most likely you will consider it as one of the dingiest and most unattractive-looking animals that you have ever seen. But if you rinse it two or three times over in clean water till every atom of mud has been washed out of its bristly coat, you may change your opinion. For now you will see all the colors of the rainbow playing over it—crimson, purple, orange, blue, and vivid green—just as if every hair were a prism. It would be difficult, indeed, to find any creature more beautiful in the waters of the sea. This bristly coat is really a kind of filter, which strains out the mud from the water that passes to the gills.

LEECHES

Leeches, too, are annelids, living in fresh water instead of salt water. They are famous for their blood-sucking habits, and when we examine their mouths through a microscope we find that they are provided with three sets of very small saw-like teeth, which are set in the form of a triangle. When a leech wants to suck the blood of an animal, it fastens itself to the skin of its victim by means of its sucker-like lips, and then saws out a tiny triangular piece of skin. That is why it is so difficult to stop the bleeding after a leech has bitten one. An actual hole is left in the skin, which does not heal over for some little time. And a great deal of blood is generally taken by the leech itself, which will go on sucking away until its body is stretched out to at least double its former size.

That is rather a big meal to take, isn't it? But then such meals come very seldom. Indeed, when a leech has once gorged itself thoroughly with blood, it will often take no more food at all for a whole year afterward!

Leeches lay their eggs in little masses, called cocoons, which they place in the clay-banks of the pools in which they live. In each of these cocoons there are from six to sixteen eggs.

We now come to the last great class of animals about which we shall be able to tell you—that of the coelenterates. It contains three most interesting groups of creatures.

JELLYFISHES

You may have seen plenty of jellyfishes if at any time you have been staying at the seaside, for they are often flung up on the beach by the retreating tide. But if you were to go and look for them two or three hours after seeing them, on a bright sunny day, you would find that they had disappeared. All that would be left of them would be a number of ring-like marks in the sand, with just a few threads of animal matter in the middle of each. The reason would be that they had evaporated! That sounds rather strange, doesn't it? But the fact is that the greater part of the body of a jellyfish is

nothing but water! It is quite true that if you cut it in half the water does not run away. But then that is equally true of a cucumber; and cucumbers, too, are made almost entirely of water. The reason is the same in both cases. The water is contained in a very large number of tiny cells; and when you cut either the animal or the vegetable across, only a few of these cells are divided, and only a small quantity of the water escapes.

Round the edge of the disk of a jellyfish which has just been flung up by the waves you will find a number of long, slender threads. These are its fishing-lines, with which it captures its prey, and they are made in a very curious manner. All the way along they are set with a double row of very tiny cells, in each of which is coiled up an extremely sharp and slender dart. These cells are so formed that at the very slightest touch they fly open, and the little darts spring out; and, besides this, the darts are poisoned. So as soon as any small creature swims up against these threads a number of the venomous darts bury themselves in its body, and the poison acts so quickly that in a very few seconds it is dead. Then other threads come closing in all round it, and in a very short time it is forced into the mouth and swallowed.

Some jellyfishes are so poisonous that they are most dangerous even to man. Only one of these, however, is found in the North Atlantic, almost all the jellyfishes that one finds lying about on the beach being perfectly harmless. But if, when you are bathing, you see a yellowish-brown jellyfish about as big as a soup-plate swimming near you in the water, be sure to get out of its way as fast as you possibly can; for if its threads should touch any part of your body, you are almost sure to be very badly stung. There is very little doubt, indeed, that many swimmers have been killed by these creatures; while thousands of unwary bathers have been laid up for days, or even weeks, from the effects of their poison.

SEA-ANEMONES

What beautiful creatures are these—just like flowers growing under the sea! Some are like dahlias, some like chrysan-

themums, and some like daisies, of all shades of crimson, and purple, and orange, and green, and it is very hard to believe that they are really living animals.

The tentacles of these creatures, which look so like the petals of flowers, are set with little cells containing poisoned darts, just like the fishing-threads of the jellyfishes. They can be spread out or drawn back into the body at will, and when they have all been withdrawn the anemone seems to be nothing more than a shapeless lump of colored jelly.

Anemones spend the greater part of their lives clinging to the surface of a rock at the bottom of the water, the broad base of the body acting just like a big sucker. They can crawl about, however, at will, and sometimes they will rise to the surface of the sea, turn upside down, hollow their bodies into the form of little boats, and then float away, perhaps for quite a long distance.

But few sea-anemones are seen on our eastern coast, because, except in the cool north, there are few rocks. On the warmer and rockier shores of California and northward, however, these lovely creatures occur in great variety.

CORALS

Last upon our list come those most wonderful little creatures which are known as corals.

These are often called coral insects, but that is a great mistake. For they have nothing to do with insects at all, and are as different from them in every way as they can possibly be. They are properly called polyps, and we can best describe them, perhaps as very small sea-anemones. But they have one property which the anemones do not possess, namely, the power of extracting lime out of the sea-water and building it up round themselves in the form of coral.

These creatures may be roughly divided into two groups, the one consisting of the simple corals, which only live together in very small numbers, and the other of the reef-builders, which live in vast colonies, and build up masses of coral of enormous size. The latter are by far the more interesting, and the way

in which they build up immense banks of coral is very wonderful indeed.

Remember, first of all, that these animals multiply in two different ways—sometimes by eggs, and sometimes by little buds, so to speak, which grow out of the body of the parent. The polyps which hatch out from eggs swim about for some little time quite freely. But after a few days they fasten themselves down to the surface of a submerged rock, and after that they never move again. Other polyps soon come and settle down by them, and before very long there will be thousands upon thousands of the little animals all growing, as it were, close together, and all gradually building up coral underneath and round the margins of their bodies.

When they reach their full size they begin to multiply by “budding.” Baby polyps sprout out all over their bodies, and these, instead of swimming about for a few days like those which are hatched from eggs, remain fixed where they are for the whole of their lives. Then they, in their turn, begin to deposit coral, and as they have nowhere else to put it they place it on the bodies of their parents, which before very long are completely covered in. Now, you see, there is a second layer of coral on the top of the first. Then in due course of time a third layer is formed upon the second, and a fourth layer upon the third, each generation being built in by the one that comes after it, till at last the coral bank rises above the surface of the water. Then the work has to stop; for these little creatures cannot live unless the waves can constantly break over them. But although the bank cannot be raised higher it can still be extended on all sides; and so the little polyps go working on, year after year, till at last the results of their labor are almost too wonderful to realize.

CORAL BANKS

These coral banks take three different forms.

First, there are the fringing reefs. These are great banks of coral surrounding the shores of a tropical island, or running for long distances on the coasts of the mainland. The island of Mauritius, for example, is entirely surrounded by a fringing reef.

These reefs often spread out for miles into the sea, and they are only broken here and there by narrow passages, where some river or stream is flowing out. For the polyps cannot live in fresh water.

Next, there are barrier reefs. These are great walls of coral at a distance from the shore, with deep water between the two. For the polyps are unable to work at a greater depth than about thirty fathoms, or one hundred and eighty feet, below the surface; and it often happens that while there is deep water close to the shores of a tropical island, there is shallow water farther out. In such a case the polyps have to build out at sea, instead of close into the land, and there is a kind of moat between the coral bank and the shore. In this case the bank is called a barrier reef, and sometimes it is of enormous size. The Great Barrier Reef, for instance, runs for no less than 1250 miles along the north-east coast of Australia.

Then, thirdly, there are coral islands, or atolls. There are thousands of these wonderful islands in the Pacific and the Indian oceans, and others are still being slowly pushed up out of the sea. They always take the form of more or less circular rings, in the center of which is a lake of sea-water called a lagoon. The coral bank of which they consist is seldom more than a few hundred feet wide, but sometimes the islands are very large indeed. The biggest of all is ninety miles long and sixty miles broad, while several others are not very much smaller. Soon after they rise to the surface of the sea a kind of soil is deposited upon them, made up partly of powdered coral, ground up by the action of the waves, and partly of decaying vegetable matter which has been flung up on them. Then sea-birds bring mud upon their feet from the mainland, or from another island at a distance, and leave some of it behind them when they settle down to rest; and in that mud are seeds of plants, which soon begin to sprout and grow. So in a very few years the island is covered with low vegetation. Then one day, perhaps, a floating cocoanut is flung up, and that, too, takes root and grows, so that in course of time there is a palm-tree. Other palm-trees, of course, follow; and the result is that the first glimpse which a traveler gets of a coral island is nearly always that of a row of palm-trees upon the horizon.

The simple corals live in almost all parts of the ocean. Some of them are occasionally dredged up off our coasts, and can live in very cold water. But the reef-builders are only found in warm seas, and are never found working far outside the boundaries of the tropics.

How wonderful it seems that tiny creatures such as these polyps, which really do not appear to be much more than little lumps of living jelly, should be able to build up these vast masses of coral from out of the depths of the sea! One cannot help wondering what the results of their work will be if the world should last for a few thousand years longer. It would really seem that by that time the tropical seas will be choked up with coral islands, and the lagoons inside them will be filled up with coral too; so that not merely islands, but continents, will have been raised from the ocean by some of the smallest and weakest and most insignificant of all living animals!

THE ANIMAL WORLD:
FOR LITTLE FOLKS

BABY BEASTS

By FLORENCE E. DUGDALE AND OTHERS

THE DONKEY

Alas for the humble goad
That looms in the life anon
Of a thoughtful Ass's foal
Like me, when I muse thereon!

Perhaps I shall pull a cart—
Perhaps I shall carry a pack—
Perhaps at a sea-resort
I shall bear little boys on my back.

BEFORE the horse was so largely used by man, the donkey was the most common beast of burden. He seems to have been domesticated at least two thousand years before Christ, and in the Bible we read that part of the wealth of Abraham and his nephew Lot consisted of he-asses and she-asses. We may be sure that these were not like some of the unhappy little creatures one sees drawing carts to-day. At that time the donkey was highly prized, and probably large and handsome.

Among our domestic animals he is certainly the worst treated. His very name is used to denote stupidity, and yet he can be trained to do many tricks, such as no unintelligent animal could perform.

Happily not every one has a hard life. A baby donkey, in a good home, where he is well looked after, repays such kindness and attention, and becomes a pretty and interesting creature. Another, born to a life of hard work, poor feeding, and ill-usage, will become sad-looking, gaunt from hunger, and ragged with neglect.

In his tame state the donkey is very patient, and he will

feed on the coarsest food, taking what other animals have left, although he is as particular as the horse with regard to his drinking, and will touch none but the cleanest water.

The donkey has long ears, and his tail ends in a sort of tuft. His general color is a mousey gray, or brown, but sometimes he is white or cream-colored, and then he is much valued. In the East such creatures were ridden by people of high rank.

In his wild state the ass is found in large troops in the plains of central Asia, and in Africa also. The wild ass is beautiful in form, rich in color and markings, and swift and sure-footed. At times he is rather fierce and formidable.

Perhaps it is in Spain that the ass is most valued to-day; for there is hardly a peasant in that country who does not own and love a favorite ass.

Here is an interesting story of a donkey who liked society. His name was Jacob, and he was hired from a villager to work on a gentleman's estate. He was an industrious creature, and when his day's labor was over he was turned into a barn-yard, in company with a cow and an old pony.

Jacob was quite happy with his two companions, until a day came when the cow was moved away to fresh pastures, and the poor old pony was shot, leaving the donkey in solitary state. But loneliness was not to his liking, and he made up his mind to go back to his old home.

Somehow he managed to open the gate of the yard; then he trotted through the park, unlatched two more gates on his way, and reached the cottage, where he made his presence known by braying gladly.

He was taken back to the yard the next morning, and the gate fastened firmly, but that same afternoon he opened it again and returned for the second time to his old home. It was then understood that Jacob refused to live alone, and, because he was so useful and amiable, the cow was brought back. Pleased at regaining his companion, Jacob made no more attempts to escape.

THE RAT

Great rats, small rats, lean rats, brawny rats,
Brown rats, black rats, gray rats, tawny rats,
Grave old plodders, gay young friskers,
Fathers, mothers, uncles, cousins,
Cocking tails and pricking whiskers,
Families by tens and dozens . . .
Step by step they followed dancing.

—ROBERT BROWNING.

ALTHOUGH he is a great pest, and one of the most unwelcome visitors that could enter a house, yet it is difficult not to have a sort of respect for cunning Mr. Rat.

He is a shrewd, intelligent creature, and when he is tamed, can be made to perform many tricks, as anyone who has kept pet white rats will know.

Mrs. Rat is a most affectionate mother, and she will boldly face any foe who threatens her family. Unfortunately, the father rat does not properly understand his duties as a parent, for, when he pays a visit to his young ones, it is generally with the intention of eating them. The mother understands this so well that, should her husband approach the nest while she is on guard, she will drive him away with much fierceness. If she happens to be out when her husband calls, it is quite likely that she may return to find her nest empty.

Mrs. Rat has plenty to do, for she has five or six families during the year, and from eight to fourteen children in each family. The baby rats grow up very quickly, and when six months old they are ready to have nests and families of their own.

There are millions of rats in this country, and each does at least a quarter of a cent's worth of damage a day. Worse still, the brown rat is known to spread among men a terrible disease, called the plague.

Rats have been known to empty a flask of oil by dipping their tails in, and then licking off the oil with much enjoyment.

HOW THE RATS STOLE THE EGGS

An amusing story is told of the way some rats made off with a stolen egg.

Several of these cunning creatures were seen to creep cautiously up a broken ladder to a hen-roost. Presently they came back with their prize, which was carried in this manner. One large rat was on his back, with the egg carefully held between himself and his two front paws, and in his mouth was a straw, by means of which a rat on either side dragged him along. It was difficult to say whether he suffered any discomfort from the bumping, but certainly he made no sound.

DUTIFUL CHILDREN

That rats can be kind and dutiful to a parent is shown by another interesting story.

"Early this morning," writes a naturalist, "I was sitting reading, when I heard a noise behind the wainscot. I watched, and presently I saw a rat make his appearance at the mouth of a hole. He looked round carefully, and then went back. A moment after I saw him come again, this time leading by the ear a second rat, who seemed quite old and feeble. Another young rat followed the strange pair, and then I saw the two young ones run round the room, collecting crumbs which had fallen from the supper table the night before, and carry these to the old rat, who had remained waiting by the hole. I saw then that the old rat was blind, and that, most likely, the two young ones were her children who were feeding her in this way.

"At that moment a door opened, and the two young rats gave a warning cry. Then all three disappeared, the blind rat as before being led by a young one."

THE GORILLA AND CHIMPANZEE

By C. E. SMITH

“**H**OW very like a man I look,” said the gorilla, the biggest, ugliest ape. “I have thirty-two teeth and a broad, flat chest, just like that of a man. I don’t wear a tail, and I am called a man-like ape.”

“So am I,” remarked the chimpanzee, who lives near the equator and is the wisest of all the apes. “But you must not think that we apes are altogether like human beings. Men like to walk upright, while we are much more comfortable on all fours. Our arms are longer than our legs. Besides a man cannot climb trees as we can.”

“You do not live in the trees as much as I do,” answered the gorilla. “You sleep on the ground, lying on your side, while I build a platform of boughs high up in the branches of a tree, and there, in the African forest, Mrs. Gorilla and the babies sleep all night.”

“What do you do then?” asked the chimpanzee.

“I prop myself up against the tree trunk down below, so as to keep watch over my family,” answered the gorilla.

“That is very nice of you,” cried the chimpanzee, “but I thought you were the fiercest and the most savage of the apes.”

“So I am,” roared the gorilla, banging his hairy chest with his hairy hands and thus making a terrible drum-like sound. “My canine or tearing teeth are almost as big as tusks, my arms are long and very strong and my body is huge; I am six feet high and everyone is afraid of me.”

“I don’t wonder,” said the chimpanzee. “You are ugly enough.”

The gorilla grinned and looked pleased. “What do you eat?” he asked.

“Birds, eggs, small animals, and nuts,” answered the chim-

panzee. "When I walk I steady myself with the backs of my hands, for I cannot straighten out my fingers; they are always curved and——"

"It is going to rain," interrupted the gorilla. "Now, if you were a man, you would go to look for your umbrella."

"But being an ape," the chimpanzee went on, "I shall just sit down and fold my arms over my chest."

"Quite right," said the gorilla. "The hair on our arms grows two different ways; on the lower part it points upward, while from the shoulder to the elbow it grows downward." As he spoke the rain came pouring down in torrents. Both huge creatures folded their arms. The rain running down their shoulders dripped off at the elbows, and so their bodies were kept quite dry.

THE ELEPHANT

By C. E. SMITH

"**H**RUMPH! Hrrumph!" Listen to what the Indian elephants say about themselves.

"Hrumph! Hrrumph! We are great lords, and our trunks are our hands. We are the biggest animals in the world and the wisest; the strongest and the most useful of the beasts of burden. In all the great shows and processions in India we walk, stately and proud in our splendid harness, bright with jewels and gold, and if you think that we make much noise when we march you are mistaken. Swish! Flop! Swish! softly and quickly we go, and proud is the prince who can go a-hunting with a hundred elephants in his train."

"The white men and the natives call us their friends, and the children love us because we are gentle and good: but let him who ill-treats us beware, for to those who are cruel, we are cruel, and to those who are kind we are kind.

"Hrrumph! Hrrumph! We are great lords, and our trunks are our hands, and our arms, and our noses, and many

other things besides. They are made of muscle, and are so strong that with them we can pull up young trees by their roots, and with the little thing at the end, which is something like a finger and a thumb, we strip the leaves from the branches, and pick the flowers and the green food which we eat.

"In our trunks, at the end, too, are the nostrils, and with these we smell the sweet flowers and fruits before eating, for above all we love those things that smell sweetly. We breathe through our nostrils, and through them we draw up the water to pour into our mouths when we are thirsty. Inside our bodies, in our stomachs, is a well which holds water, and in summer when the streams run dry, all we have to do is to put our trunks into our mouths, suck up the water from the well, and squirt it over our bodies, for we love to bathe.

"With our beautiful strong ivory tusks, which grow longer as we grow older, we defend ourselves from our enemies, from the lions and the tigers and the fierce jungle beasts. With our tusks, too, we carry heavy planks of wood for our masters, when they build, and after we are dead our tusks are made into pretty ornaments.

"Hrrrumph! Hrrrumph! We are great lords, and our king is the white elephant who lives at the court of the king of Siam, in a splendid house with a hundred men to wait upon him, and to feed him out of golden dishes."

THE HIPPOPOTAMUS

By C. E. SMITH

"YOU can come nearer, I won't hurt you," said the hippopotamus, looking at me kindly with his little bulging eyes that fit into a hard bone socket. He was wallowing about in a big tank at the zoo, for the hippopotamus spends most of his time in the water. "See how long I can stay at the bottom," he said, and down he sank underneath the water, and

there he stayed for quite ten minutes. Then just when I had made up my mind not to wait any longer up he came again, spouting water out of his nostrils like a whale. "If I were at home in Africa," he remarked, "I would show you that I can walk as quickly along the bottom of a river as I can on dry land. That is why I am called a hippopotamus, which means a river-horse, you know."

"You look more like a river-pig," I said, and hoped he would not be cross. But he was. "The hippopotamus may look like a pig," he snorted, "but he is not a pig. We are a family quite by ourselves. The pigs have cloven feet, but my four toes are shorter and partly webbed. And there is all the difference in the world between a pig's snout, with its disc at the end, and mine." Here he snorted again, rolled his big barrel of a body about in the water and opened his mouth for me to see. Oh what a big red cave it looked! In the lower jaw are two huge canine or tearing teeth like tusks, curving backward. Between these two tusks are two smaller incisor or cutting teeth and they point forward.

"I see you admire my teeth," said the hippopotamus.

"Well! I admire them myself. At home in Africa I use them to root up the lotus, papyrus, and other water-plants which are my food. My teeth are made of very hard ivory which never turns yellow, and that is more than the elephant can say about his tusks.

"Is it true that in Africa your brothers do a great deal of harm in the fields?" I asked.

"We like to eat the corn and the millet and the sugar-cane," was the answer. "And if we happen to find a fine crop we trample it down and eat it—we can eat a great deal you know—and that is why the natives hunt us and set traps for us. They make whips out of our hides and they eat our flesh," and the hippopotamus sighed and looked very sad indeed. "Good-by," he snorted. "Tell the children that a baby hippopotamus is carried about on its mother's back." So saying he sank down again to the bottom of the tank.



A MOTHER POLAR BEAR TOWING HER CUB

Copyright by Captain F. E. Fennell.

The cub had been captured with a lazo by the photographer, Captain F. E. Fennell, and was being towed to the back of his vessel, where the mother bear got in her position, and tried to pull her cub out.

THE RHINOCEROS

You never need be at a loss
In knowing a Rhinoceros,
For I am of some notoriety
In upper animal society;
The reason being, I suppose,
That just between my brow and nose
I sport, when quite grown up, a horn:
So that the name of unicorn
Was often given me in old days,
And fables whispered of my ways
Ere people knew my natural history.
Hence I acquired a sort of mystery,
Till painters of the royal arms
Made some addition to my charms
By giving me a golden chain,
And a slim figure, and a mane.

THE rhinoceros has been called the ugliest beast in the world; and although this may be true, it seems an unkind thing to say about the poor creature. If he heard what was said he might reply with truth that, even if he be the ugliest, there is only one larger, and that is the elephant.

Perhaps it is because he carries one horn, and sometimes two, on his nose, that he looks so odd. At all events, he often finds this horn most useful when he is attacked. It is sharp and long: sometimes nearly two feet in length. The baby rhino has no horn, but a little lump shows where it is beginning to grow.

The skin is not beautiful, being slate-colored, and very thick and wrinkled, while its appearance is not improved by the mud baths which the rhinoceros is constantly taking.

Although so clumsy, he is a swift runner and a dangerous enemy; even the lion will not attack him, although he sometimes carries off the young rhino. The elephant, too, is mortally afraid of that long horn.

The baby rhinoceros is well cared for by his mother, and when only a few weeks old he is strong and active, running at a great rate over the roughest ground. The mother makes her

child run in front of her, and guides him by holding the tip of her horn against his side. Some hunters manage to capture the young one by hunting the mother until the calf is too tired to keep up with her.

These animals are found mostly in families—the father and mother and one or two young ones. They feed on grass and leaves, and on a curious prickly thorn known as the “wait a bit.”

Strange to say, the rhinoceros is nearly always accompanied by a flock of birds, known as the rhino-birds, which seem never happy unless running about this creature’s back and head. It is said that these birds give the rhino warning of danger, and certainly it is true that they utter sharp cries if a stranger comes near, thus perhaps rousing him in time to defend himself.

The sight of the rhinoceros is poor, and his eyes are small and mean-looking for such a big beast, and they are set too deeply in his head for wide vision. To make up for this, however, his scent is remarkably keen.

The home of the rhinoceros is in Africa and in some parts of Asia.

Not long ago a baby rhino, named Billy, was sent from Nairobi in Africa to London, as a present to the king. With him there traveled a native attendant, who had looked after him most carefully from the day of his capture. Billy was very fond of this attendant, and the two often slept together. Every time the native left the young rhinoceros, the poor little creature would utter wailing cries, and seem restless and unhappy until he came back. Then Billy would show much joy, and even lick the naked feet of his friend.

The final parting between the two was rather sad, for the native had to go back to his own country. Fortunately there was, in the Gardens of the Zoological Society, where Billy had to live, another rhinoceros named Theodora, and she became his devoted companion.

THE TIGER

Tyger! Tyger! burning bright,
In the Forests of the Night,
What immortal Hand or Eye
Could frame thy fearful symmetry?

—WILLIAM BLAKE.

FEROCIOUS, yet majestic in his strength and terrible in his beauty as he stalks through the jungle, surely among animals the tiger has no equal.

His home is in the continent of Asia, particularly in India and the north of China. The royal Bengal tiger is the largest and fiercest of his kind, and he is to be found in the hot, swampy lands in and around the delta of the River Ganges. The tiger prefers grassy plains and swamps, but he lives in dense forests also, and he seems to have a fancy for haunting ancient ruins.

As a rule the tiger does not climb trees, but he has been known to do so when pressed by fear. He is a good swimmer, and takes to the water readily.

Few creatures have a more beautiful coat; it is of a flame-like orange color, marked with dark, almost black, stripes. The under-body, the inside of the limbs and a large spot over each eye are white.

Full-grown, the tiger is an immense creature, nearly ten feet in length, sometimes much larger. The largest tiger known to have been shot in India was thirteen and a half feet in length.

BABY TIGERS

The tigress has from two to three cubs at a birth, but the usual number is three. These, like all the young of the cat tribe, are extremely playful. The mother guards them with the greatest care and watchfulness, and she keeps them with her

until they are about two years old, and able to provide for themselves. She will defend them with her own life, and when robbed of them her rage is terrible; but she has been known to eat her cubs when starved.

When the young need food, other than her milk, the mother kills for them, and in time she teaches them to find their own prey. At first they practise on small animals, such as deer, and calves, and young pigs. It is at this time that the tigress is most bloodthirsty, perhaps in order to teach her cubs, although, as a rule, the young do far more damage than the old ones. They will kill as many as four or five oxen at a time, and leave these half eaten, while sometimes they will merely tear the throat of their prey and drink its blood.

The older tiger is not so wantonly destructive as this; he slays to satisfy his hunger, and a cow or a bullock will last him about four days. He drags his "kill" away to some sheltered spot, and returns to it each evening.

MAN-EATING TIGERS

A few tigers are man-eaters. These dreaded creatures have been known to keep an Indian village in a state of terror for months at a time, carrying off a man or a woman every few days, and some are known to have killed over a hundred people.

The regular "man-eater" is generally an old beast, whose teeth are worn and damaged; one, in fact, who finds it easier to prey on men than on cattle. But this is not always the case.

IN CAPTIVITY

It is a sad sight to see a tiger in captivity, as he restlessly paces up and down. His eyes are quite wonderful, at one moment yellow, then changing to green, and sometimes red, like fire, and he seems to be ever gazing far away. Perhaps he is dreaming of the jungle, where he would like to be, or of the sandy desert, under the gleaming stars, where he could leap upon his prey in the silence of the night.

THE CAMEL

People would laugh if you rode a giraffe,
Or mounted the back of an ox;
It's nobody's habit to ride on a rabbit,
Or try to bestraddle a fox.
But as for the camel, he's
Ridden by families—
ANY LOAD does for me.

—CHARLES E. CARRYL.

I WONDER whether the baby camel ever dreams of what his life will be. Does he dream of the sun beating down on the burning sand, of the miles and miles of desert that have to be crossed before a green oasis appears in sight? Does he know of the terrible sand-storms, when he will have to crouch on the ground, his eyes and nostrils closed, while his master shelters behind him? If he does know of these things perhaps he wishes he could be a horse, and live in a country where there are no deserts at all.

The mother camel has only one baby at a time. Eight days after birth the young one stands three feet high, but he does not finish growing until he reaches the age of sixteen or seventeen, and he lives to be forty or fifty years old.

The young camel is fed on his mother's milk until he is a year old. Camels' milk is a good and nutritious food, and of great value to the Arab, but it is too thick to be used in coffee or tea.

TRAINING A CAMEL

When four years of age the camel is trained to be a beast of burden. He is taught to kneel and to rise at the word of command, and to carry loads which are gradually made heavier and heavier. The camel is able to carry a load in the desert twenty-five miles a day for from three to five days without water, but after this time he needs a good drink. For food he

has nothing but the small tough plants that grow in the sandy desert. To fit him for this way of living he has a stomach with cells in it, something like a honey-comb, in which he is able to store water, and he has also a supply of fat in his hump, with which he is nourished when he has to go without food. One kind of camel, known as the Bactrian, has a double hump; but the true Arabian camel has only one.

Before going on a journey the master looks anxiously at the hump. If that is large and firm the animal is strong and well-fed, but a small and flabby hump means a weakly and half-starved camel.

The long hair is generally of a dusty light-brown color; but sometimes it is black and sometimes nearly white. The camel is generally considered a meek and docile creature, but he may have a very vicious temper, as this story will show.

A CAMEL WHO REMEMBERED AN UNKINDNESS

A camel who worked at an oil mill once had a hard beating from his driver. For some time after he was sulky and dangerous, so the driver kept a strict watch upon him. Some months passed, and then the camel was as quiet and obedient as ever, and the driver began to think that the beating was quite forgotten.

At last, one night the camel was stabled in a corner of the mill, as usual, while the driver was sleeping on a platform close by. The man happened to awake, and in the moonlight, he saw the camel slyly turning his head, and looking at a bundle on the floor. A cloak had been thrown over this bundle, giving it the appearance of a sleeping man.

The camel, beyond a doubt, thought this was his driver, for he crept quietly toward the bundle, and threw himself upon it, biting fiercely. Then, thinking, it seemed, that he had killed his enemy, he was going back to his corner when the driver sat up and spoke. At the sound of the well-known voice the camel was so enraged and disappointed that he dashed his head against a wall and died on the spot.

THE GIRAFFE

I am no camel, cow or calf,
But a queer thing they call "Giraffe,"
At whose long neck some people laugh.

And I am really soft and mild,
And would not hurt the smallest child,
Or frailest life that roams the wild.

AT first sight the giraffe seems a most comical animal, for he has such a long neck, and his body slopes so queerly from the shoulder to the tail. Of all living creatures Mr. Giraffe is the tallest, for he measures eighteen to twenty feet from his hoof to his head.

His eyes are so placed that he can see nearly all round him and for a long distance, even while eating; and because of this he is a most difficult animal to stalk. Not only are his eyes sharp at seeing, but they are also most beautiful—large, brown, and very mild.

A GENTLE INOFFENSIVE CREATURE

The giraffe is a gentle creature, and would not harm a living thing: he does not even damage the growing crops. He has only two enemies, the lion and man: the lion kills him for food, and men hunt him for his skin, which is two inches thick, and of a fine mottled chestnut color.

A great African traveler and hunter said that he had no pleasure in shooting this animal, since it was so inoffensive, and, at times, so extremely tame. It makes no sound whatever, and even when pulled down by a lion it dies without a cry or murmur.

PHYSICAL CHARACTERISTICS

On the head of the giraffe are two little horns, about four inches in length, and covered with skin. These are not to be

seen on the young one, but he will have them when he is a little older. Like the rhinoceros, the giraffe lives in families, and sometimes in herds of about fifteen or twenty. He is a native of Africa.

Young, delicate shoots and buds, and the leaves of such trees as the acacia and the mimosa, are the favorite food of the giraffe. His long neck is of the greatest service to him in reaching foliage, and it must be because of this food that his skin sometimes gives off a pleasant smell, like a hive of heather honey.

The tongue of the giraffe is very thin, and about eighteen inches long, and can be curled about in the most curious way. He plucks leaves very delicately, and many a lady visitor at the Zoo has been astonished to find a long neck bending over her, and a thin tongue curling about some flowers or feathers in her hat.

The tail of the giraffe is long, and has a tassel of wiry black hair on the end, which is useful for switching away flies. His legs look slender, but they are so strong that he can overturn a horse with one good kick, and even keep a lion at bay.

While trotting the giraffe has a strange movement, something like that of a camel, and when he breaks into a gallop he goes along quite comically, looking just like a rocking-horse. So quickly does he run that a swift horse is needed to overtake him. As he gallops he kicks up a shower of pebbles with his hind hoofs, and because of this it has been said, rather absurdly, that he pelts his pursuer with stones.

Another strange thing about the giraffe is that he can live, if need be, for six or seven months without water. He gets all the moisture he requires from the juicy shoots and leaves that he eats; nevertheless, he does not disdain to take a deep drink when he can.



Courtesy of the Metropolitan Museum of Art

THE KANGAROO

I hardly like to own to you
That my odd name is—Kangaroo!
And it is not alone my name
That gives me an amusing fame,
But my form also; for you'll find
Short legs in front, and long behind!
While underneath—this truth I'll vouch—
To hold my child I wear a pouch.
And last I have so huge a tail
That men might use it for a flail.

AMONG the queer animals to be found in Australia, that country of so many odd things, the kangaroo is one of the very queerest.

He belongs to that class of creatures which carries the baby in a pouch or bag. When the young kangaroo is first born he is very tiny, hardly more than an inch, in fact, and soft, helpless, and half transparent, like an earth-worm. The mother places this little creature in her pouch, and there he remains, growing larger and larger, and gaining strength each day. Soon he is strong enough to poke out his head from time to time, and at last he is able to jump out of the pouch when he wishes to crop the grass, but at the least sign of danger he scrambles back to a place of safety. By the time he is eight months old he weighs about ten pounds, and then, being somewhat too heavy for his mother to carry any longer, he leaves the pouch for good.

In his native haunts the young kangaroo is known as "Joey," and his father as "Boomer," or "Old Man."

In color the kangaroo is a grayish-brown. The young ones, at first, are of a lighter shade than their parents, but their fur deepens so quickly that, when they are two years old, they are much darker. After that age the fur grows light again.

The strange appearance of the kangaroo is due to the fact that his fore limbs are only half the length of the hind legs, and are used chiefly as hands. Sometimes, it is true, the

kangaroo goes on all fours, but the moment he is disturbed he makes off with flying leaps. The length of the jump of a full-grown kangaroo is about fifteen feet, and he can easily clear a bush or fence nine feet in height.

The hind legs of the kangaroo are extremely strong, and on each stout foot are four toes with sharp claws. The fourth toe has a nail, nearly twelve inches in length, and this is a good weapon for him to use in time of danger. He is hunted by powerful hounds known as "kangaroo dogs," and these have enough to do to keep up with him in full flight.

When the kangaroo turns at bay, it is dangerous for dog or man to approach. With one stroke of that terrible nail he can tear open any dog that ventures too near, and has been known to kill many a man in the same way.

One trick of his, when he is hard pressed, is to rush into any shallow water he may be near. There he stands at bay, and woe to the first dog that follows, for the kangaroo will seize this luckless creature in his paws, and hold him under water until drowned. Indeed, the kangaroo has been known to put one dog under his feet, and drown him thus, while he catches another dog with his fore paws. Any venturesome man who goes too near at such a time is likely to get a good ducking. A gun, however, generally puts an end to this struggle.

When pursued the kangaroo has a curious habit of constantly turning his head and looking behind.

It is for the sake of his skin that the kangaroo is hunted, and for his flesh also. The most precious tit-bit is the thick tail, about three feet in length, which is so useful in helping the animal to sit up on his hind legs. Soup made from the tail is said to be very good.

The mother kangaroo is not able to run or to fight like her mate, and, when hunted, she has been known to lie down and die of sheer fright.

THE DOG

I understand men call a pup
A thing of mischief till grown up:
Can that be really true?
We only nibble shoes and hats,
And tear the rugs, and tease the cats,
And that's not much to do.

When we are big and strong and tall
We shall not do such things at all,
But walk with solemn tread
Behind your heels, and keep strict guard
Upon your house and field and yard,
When you are snug in bed.

IT was before the dawn of history, long ages ago, that the dog was first domesticated by man. To-day he is our most faithful servant and companion. It is hard to realize that he is descended from the treacherous wolf and the slinking jackal; and, indeed, it can be imagined that the dog himself is ashamed of these disreputable relatives, and disowns them whenever he has the chance.

Since in a state of nature dogs run down their prey, it is to be expected that they should be equipped with legs that are long, strong, and muscular. The cat, which jumps for her prey, has much more delicate legs, but has powerful hips that enable her to leap. The dog's feet are much more heavily padded than those of the cat, and therefore in running he need not stop to save his feet. Hounds often return from a chase with bleeding feet, despite the heavy pads, but the wounds are usually cuts between the toes. The claws are heavy and are not retractile; thus they afford a protection to the feet when the animal is running, and they are used also for digging out game which burrows into the ground. The claws are not used for grasping game, as are those of the cat, and are used only incidentally in fighting, while the cat's claws are her most important weapons. It is an interesting fact that Newfound-

land dogs, which are famous swimmers, have their toes somewhat webbed.

The dog's body is long, lean, and very muscular, a fat dog being usually pampered and old. The coat is of hair, not of fine fur like that of the cat. It is of interest to note that the Newfoundland dog has an inner coat of fine hair comparable to that of the mink or the muskrat. When a dog is running, his body is extended to its fullest length; in fact, it seems to lie flat, the outstretched legs heightening the effect of extreme muscular effort of forward movement. A dog is master of several gaits; he can run, walk, trot, bound, and crawl.

The iris of the dog's eye is usually of a beautiful brown, although this varies with breeds; in puppies the iris is usually blue. The pupil is round, like our own. It is not arranged with a slit, as is that of the cat, and therefore dogs cannot see well in the dark; but in daylight they have keen sight.

A DOG'S SENSE OF SMELL

The nose is even more efficient than are the eyes, and it is on the sense of smell that the dog depends for following its prey and for recognizing friend and foe. The damp, soft skin that covers the nose has in its dampness the conditions for carrying the scent to the wide nostrils, which are situated at the most forward part of the face, and thus may be lifted in any direction to receive their marvelous impressions, so completely beyond our comprehension. Think of being able to scent the track of a fox made several hours previously! Not only to scent it, but to follow by scent for many miles without ever having a glimpse of the fleeing foe! In fact, while running, the dog's attention seems to be focused entirely on the sense of smell, for I have seen hounds pass within a few rods to the windward of a fox they were chasing without observing him at all. When the nose of any of the moist-nosed beasts, such as cattle and dogs, becomes dry, it is a sign of illness. A light fall of damp snow gives the dog the best conditions for following a track by scent.

A hound when on the trail will run until exhausted. There

are many authentic observations which show that hounds have followed a fox for twenty-four hours without food and probably with little rest.

A DOG'S WEAPON

The dog's weapons for battle, like those of the wolf, are his tushes. With these he holds and tears his prey; with them he seizes the woodchuck or other small animal through the back and shakes the life out. In fighting a larger animal the dog leaps against it and often incidentally tears its flesh with his strong claws; but he does not strike a blow with his foot, like the cat, nor can he hold his quarry with it.

Dog's teeth are especially fitted for their work. The incisors are small and sharp; the canine teeth, or tushes, are very long, but there are bare spaces on the jaws so that they are able to cross past each other; the molar teeth are not fitted for grinding, as are the teeth of a cow, but are especially fitted for cutting, as may be noted: if you watch the way a dog gnaws bones, first gnawing with the back teeth on one side and then on the other. In fact, a dog does not seem to need to chew anything, but simply needs to cut his meat in small enough pieces so that he can gulp them down without chewing.

EXPRESSING EMOTIONS

Of all domestic animals, the dog is the most nearly human in expressing emotions. If delighted, he leaps about giving ecstatic little barks and squeals, his tail in the air and his eyes full of happy anticipation. If he wishes to be friendly, he looks at us interestedly, comes over to smell us in order to assure himself whether he has ever met us before, and then wags his tail as a sign of good faith. If he wishes to show affection, he leaps on us and licks our face or hands with his soft, deft tongue, and follows us jealously. When he stands at attention he holds his tail stiff in the air and looks up with one ear lifted. When angry he growls and shows his teeth, and the tail is held rigidly out behind as if to convince us that it really

is a continuation of his backbone. When afraid he whines and lies flat on his belly, often looking beseechingly up toward his master as if begging not to be punished; or he crawls away out of sight. When ashamed he drops his tail between his legs and with drooping head and sidewise glance slinks away. When excited he barks, and every bark expresses high nervous tension.

Almost all dogs that chase their prey bark when so doing, which would seem at first to be a foolish thing to do, since it reveals their whereabouts to their victims and also adds an incentive to flight. But it must be borne in mind that dogs are descended from wolf-like animals, which naturally hunt in packs and do not stalk their prey. The baying of the hound is a most common example of this habit, and when we listen we can understand how by following this sound the pack is kept together. Almost all breeds of dogs have an acute sense of hearing. When a dog bays at the moon or howls when he hears music, it is doubtless a reversion to the wolf habit of howling to call together the pack or in answer to "the music of the pack."

THE KITTEN

"A black-nosed kitten will slumber all the day;
A white-nosed kitten is ever glad to play;
A yellow-nosed kitten will answer to your call;
And a gray-nosed kitten I wouldn't have at all."

MORE than two thousand years ago the cat was a sacred creature to the Egyptians, and blinked on luxurious cushions in their temples. To-day kitty is the most favored pet of many a household.

Although so soft and innocent, she is strikingly like her cousin the tiger cub, and one has only to look at her carefully to realize that she belongs to the same family as such beautiful and terrible animals as the lion, the leopard, and the jaguar. The cubs of these wild creatures all resemble the kitten, and are quite playful and amusing, although they grow up to be

bloodthirsty individuals. Even pussy, by the way she catches and plays with some unhappy mouse or bird, shows the instincts of her order.

The cat family is carnivorous, that is, flesh-eating, and destructive. Each member boasts slender limbs, an elegant form, a sleek, loose coat, and nearly always beauty of coloring. The soft little paws of kitty are padded in just the same way as those of the lion and tiger; she has the same dry, rough tongue and the same pointed teeth, with sharp cutting edges. The eyes of the cat family are formed for use both by night and day; in the light the pupil narrows to a mere slit, and in the darkness it becomes large and round, so as to take in every ray of light.

The ordinary domestic cat is affectionate and gentle, but in woodland and forests there are to be found cats who have left their homes and lead a savage life, preying on smaller creatures, particularly game.

The mother is greatly attached to her kittens, and suffers much when they are taken from her. It has been said that pussy cares more for a comfortable home than for her master or mistress, but this has often been proved to be untrue.

A cat has a wonderful capacity for finding her way over strange ground. A year or two ago a lady gave her cat to a friend who was living three hundred miles away. Pussy was sent by train to her new home, and at first she seemed quite happy and contented. In two days, however, she was missing, and a week later she was found sitting on the doorstep of her old mistress's house. When the door was opened she walked in and greeted her friends by purring loudly and rubbing herself against their legs. Her claws were much worn and she was thin, having evidently walked the whole distance.

The dog is generally looked upon as pussy's greatest enemy, but at times he has acted as her champion, and cases have been known of dogs watching carefully over kittens in the absence of their mother.

A lady who owned a pet pug had a wee kitten given to her. At first the doggie was absurdly jealous, and would not stay in the same room as the new-comer. After a few days the pug

went to his mistress in a state of great excitement, and pulled at her dress so earnestly that at last she followed him from the garden to the living-room.

There she found the kitten, almost choked by the cord of the window-blind, which had become twisted round the little creature's neck during her play. The cord had to be cut to save kitty's life, and while this was being done the pug stood looking on with great satisfaction. From that day the dog took the kitten under his protection, and they became the best of friends.

THE COLT

My shape will be familiar quite,
For I must often meet your sight
In shady stall or meadow bright.

And sometimes I fling up my heels,
And gallop round about in wheels,
For a Colt frolics as he feels;

But when I'm nearing four years old,
I shall be harnessed, I am told,
And trained to work; and, maybe, sold;

And have to pace strange streets, or roam
A long way from my early home,
Or daily tread the heavy loam.

The one to whom I must submit
Will rule me with a rein and bit.
I rather dread the thought of it!

But I must hope that he'll be kind
And guide me well. Then he will find
That I obey his master mind.

HERE is a story of a clever animal.

In a certain orchard there was a tree on which grew a fine kind of apple. The owner watched the fruit growing riper day by day, and he was pleased to think what a good crop he had. At last it seemed to him that the apples were disappearing. He looked closely at the tree and made up his mind that some one had been stealing them.



"HOW COMICAL"

Determined to find who the thief might be he kept watch, and soon he saw his favorite mare, Fancy, lifting with her teeth the latch of a wicket gate that led from a field in which she had been grazing. She entered the orchard, followed by her foal, and went straight to the apple-tree and bumped herself against the trunk. Down came a shower of apples, upon which the two animals feasted.

When all the fruit was eaten, the culprits made their way back to the field, Fancy carefully closing the gate after her. You may be sure it was the last time she was able to unlatch that gate.

LEARNING TO WORK

The horse is a most faithful servant to man. So trusty is he, so steadfast and obedient, that one can hardly imagine him to be the same creature as the gay young colt that frolics in the meadow.

When the colt is from three to five years old, he is broken to harness. He has to learn many things: to obey his master's voice, to wear the bit and bridle, and to do that work for which he has been bred. A colt that will be a sturdy worker is often broken in by being used in the plow with an older horse. He soon learns his work and does it willingly.

MOTHER HORSES AND THEIR BABIES

It is a pretty sight to see a mare with her foal; the mother arching her neck over the little one, kissing him and neighing gently.

In a field, where several mares with their foals were put to graze, there was an old pony named Tom. This pony always took upon himself the care of the youngest foal in the field, behaving exactly as if he were the nurse. Whenever another horse came near the foal over which he had mounted guard, Tom would run at him with open mouth and drive him away. But no sooner did a fresh foal come into the field than Tom transferred his attention to that.

"Now you must do without me," he seemed to say; "there is a new baby here for me to look after."

Wild horses are to be found in many countries, such as Tartary, and South America. In Tartary they live in herds, many thousands in number, each herd acting under a single leader and obeying his commands.

In the Shetland Islands at the north of Scotland are to be found numbers of quaint little ponies, running wild, and these may be owned by any person who is clever enough to catch them. Although so small the Shetland pony is a spirited little creature, and will carry children on his back with the greatest ease.

THE LAMB

A frisky lamb
And a frisky child
Playing their pranks
In a cowslip meadow:
The sky all blue
And the air all mild
And the fields all sun
And the lanes half shadow.

—CHRISTINA G. ROSSETTI.

IN the early spring-time in the green meadows, there is nothing prettier to be seen than the lamb, as he frolics by the side of his ewe. He is the emblem of all that is innocent and helpless.

The Bible tells us that nearly two thousand years ago the shepherd carried his lambs in his bosom, and to-day, in our own country, we can still see them being tended with the same loving care.

The lamb is born quite early in the year, often in cold and wintry weather. Sometimes a heavy snow falls while the ewes, with their young, are in the meadows, and this causes great anxiety to the shepherd. He goes to look for them, and guided by a little hole in the snow, made by their breath, he often finds the ewe with her young one buried deeply. Then he rescues them, and carries them to warmth and shelter.

While the lambs are very young the shepherd has to be near them by night and by day, and so he lives in a strange little hut on wheels. Sometimes a young lamb loses his mother, and has to be fed with milk from the spout of a tea-pot; he generally learns to drink in this way quite cleverly.

When a ewe has lost her own lamb, the shepherd gives her another to care for; but as a rule she will have nothing to do with any lamb that is not her own. To overcome this difficulty the skin of the dead lamb is tied over the living one, and the ewe accepts him. She seems to recognize her own child by the smell. Sometimes a lamb will frolic up to a strange ewe, taking her for the right mother, but the ewe will not be friendly, and, putting her head down, butts the lamb away.

Young lambs are so playful that sometimes, when in a field lying on a slope, they are in danger of running themselves to death.

The sheep is generally considered to be a rather stupid and timid animal, but in many cases she shows herself to be brave and intelligent. A ewe will boldly protect her young against a stranger, and she has even been known to butt at, and knock down, a sheep-dog that has gone too close to her lamb.

A story is told of a pet lamb who was particularly fond of parsley, and would make his way into the kitchen garden and help himself freely to the coveted dainty. He did this so often that at last his owners had to protect their parsley with a glass-covered frame. Soon, to their surprise, they found the glass broken and the parsley eaten as before. They put fresh glass in the frame and kept watch; and then the lamb was seen to bring a stone in his mouth, smash the top of the frame, and eat the parsley so carefully that he did not even suffer one scratch from the broken glass.

It is said that sheep are extremely fond of music. In the East, where the shepherd still leads his flock instead of driving it, they may be often seen following obediently while their leader is blowing a few sweet notes upon his flute.

THE CALF

An old farmer, one morn, hurried out to his barn,
Where the cattle were standing, and said,
While they trembled with fright, "Now which of you,
last night,
Shut the barn door while I was in bed?"
Each one of them half shook his head.

Now the little calf, Spot, she was down in the lot,
And the way the rest did was a shame;
For not one, night before, saw her close up the door
But they said that she did, all the same;
For they always made her bear the blame.

Said the horse, Dapple-gray, "I was not up this way
Last night, as I now recollect";
And the bull, passing by, tossed his horns very high,
And said, "Where's the one to object,
If I say 't is that calf I suspect?"

"It is too wicked, now," said the old brindle cow,
"To accuse honest folks of such tricks."
Said the cock in the tree, "I am sure 't wasn't me";
All the sheep just said, "Bah!"—there were six;
And they thought, now that calf's in a fix!

"Of course we all knew 't was the wrong thing to do,"
Cried the chickens; "Of course," mewed the cat;
"I suppose," said the mule, "some folks think me a fool,
But I'm not quite so simple as that,—
Well, that calf never knows what she's at!"

Just then the poor calf, who was always the laugh
And the jest of the yard, came in sight.
"Did you shut my barn door?" said the farmer once more;
And she answered, "I did, sir, last night;
For I thought that to close it was right."

Now each beast shook his head: "She will catch it," they
said;
"Serve her right, for her meddlesome way."
Cried the farmer: "Come here, little bossy, my dear,
You have done what I cannot repay,
And your fortune is made from to-day.

"Very strangely, last night, I forgot the door quite
And if you had not closed it so neat,
All the colts had slipped in, and gone straight to the bin,
And got what they ought not to eat,—
They'd have foundered themselves upon wheat."

Then each beast of them all began loudly to bawl,
The mule tried to smile, the cock to crow;
"Little Spotty, my dear, you're the favorite here,"
They all cried; "we're so glad it was you!"
But that calf only answered them, "Boo!"

AMONG the animals to be met with in a farm-yard there is none more pathetic and gentle than the calf. He is a pretty creature, too, with tender eyes, large leaf-like ears, and a coat like velvet.

It is most amusing to watch the behavior of cattle when a young calf is brought into their midst for the first time. They do not give him a warm welcome; on the contrary, they push him rudely aside, until he learns to follow meekly behind his elders, and when feeding-time comes he must not venture near the food-rack until all of his companions have begun their meal. This is rather hard, for Master Calf has a particularly large appetite.

Perhaps he comforts himself with the thought that *his* day will come, for, as soon as a younger calf is put into the farm-yard, he will be able to snub that one, in his turn.

There are few animals more useful than the cow. She supplies us with milk, butter, and cheese; glue is made from her hoofs and ears and the parings of her hide; her hair is used by builders to make mortar; all kinds of leather goods are made from her hide, and her bones are used in several ways.

In some parts of Australia, and on the Pampas of America, large herds of cattle roam about freely. These have all sprung from domestic cattle, which have been allowed to run wild, or have escaped from their owners. Although these oxen appear to belong to no one, they are all private property, and when they are quite young calves, the name or initial of their owner is burned deeply in their skins.

In Africa oxen are used for drawing wagons over rough roads, and perhaps these poor creatures have as hard a time as any. Very different is the life of the Brahmin bull in India. This animal is looked upon as sacred, and he is allowed to wander about the streets at his own sweet will, doing exactly what he likes. If he chooses to march into a fruit or vegetable

store, and sample the goods, no one will dare to drive him away. Like a spoiled child the Brahmin bull is inclined, at times, to be more than a little tiresome, and, on the whole, our own calf is a better behaved and more useful creature.

THE LLAMA

Mere beast of burden though I be,
I am proud of my utility;
And therefore should not feel depressed
But for one fact to be confessed:
It is that, being a simple llama—
An understudy in Nature's drama
Of him that heads our family,
The camel—large, compared with me,
(I only carry a hundredweight
And he a thousand as his freight)—
I feel myself looked down upon
In pitying comparison,
As if, whatever my application,
I only were an imitation.

However, now, as I have heard
Without much grief, mules are preferred.

NEARLY five hundred years ago, when the Spaniards became masters of the country of Peru in South America, they found there an amazing number of hardy little animals, in appearance something between a camel and a sheep. These were called llamas, and finding that they were of great use to the natives, the Spaniards quickly pressed them into their service. There was much silver found in that country, in the Potosi silver-mines, and it is said that at one time 300,000 llamas were constantly engaged in bringing down silver to the coast.

Although the llama is like a camel in appearance, yet his way of life is very different. He does not live in the sandy desert, and work under the burning sun; his home is among the lofty Andes, the highest mountains in the world, and he is to be met with at a height of 20,000 feet above the sea, while all around him and above are the snow-clad peaks. His feet show that he is formed for such a life. To enable him to

leap from rock to rock and climb steep precipices, his toes have strong nails, and look like two hard little hoofs on each foot.

His neck is long and camel-like, but he resembles the sheep in having thick, clinging wool, and it would puzzle any one to say whether his face were more like that of a camel or a sheep. The largest, or true llama, stands about four feet high, and his wool is of a whitish-brown color.

When used as a beast of burden the llama can travel about sixteen miles a day, and carry a load of about a hundred pounds. He is a willing and obedient servant up to a certain point, but he will do no more than his fair share of work. If a single pound more than he thinks he ought to carry be added to his burden he promptly refuses to move. Neither words nor blows are of the slightest use; the only thing to be done is to make his load easier.

Even in the zoological gardens one may see the llama refuse to do his work if he thinks there is one child too many in the little carriage he draws behind him. One must be careful to be polite to a llama, for he has a habit which is far from pleasant. When he is annoyed—and sometimes he will take offense even at a look—he will discharge a mouthful of saliva into the offender's face.

Besides the true llama, there are three others: one, called the vicuna, which has hair that can be woven into the finest cloth; another, called the alpaca, whose hair is also valuable; and a fourth, called the guanoco, which is, perhaps, the most intelligent of the family. The guanoco, like his cousin the camel, is able to go without drinking for a long while, and when there is no fresh water to be had he will be well satisfied with salt. There is one remarkable story told about him. Travelers say that when he feels he is dying, the guanoco leaves his fellows and makes for some place, perhaps hundreds of miles away, where members of his family have died before him, it may be for several generations.

There is something very strange and sad in the thought of this hardy little creature, mortally wounded perhaps, or stricken by some fatal illness, setting out undismayed on that last sad journey.

HOW TO KNOW THE BIRDS

The bird is little more than a drift of the air brought into form by plumes; the air in its quills, it breathes through its whole frame and flesh, and glows with the air in its flying, like a blown flame; it rests upon the air, subdues it, surpasses it, outraces it—is the air, conscious of itself, conquering itself, ruling itself.

Also, into the throat of the bird is given the voice of the air. All that in the wind itself is weak, wild, useless in sweetness, is knit together in its song. As we may imagine the mild form of the cloud closed into the perfect form of the bird's wings, so the wild voice of the cloud into its ordered and commanded voice; unwearied, rippling through the clear heaven in its gladness, interpreting all intense passion through the soft spring nights, bursting into acclaim and rapture of choir at daybreak, or lispings and twittering among the boughs and hedges through heat of day, like little winds that only make the cowslip bells shake, and ruffle the petal of the wild rose.

—JOHN RUSKIN.

THE SPRING MIGRATION

From THE CORNELL RURAL SCHOOL LEAFLET

'Tis the sweetest thing to remember
If courage be on the wane,
When the cold dark days are over—
Why, the birds go North again.

—From *When the Birds Go North Again*,
By ELLA HIGGINSON.

FROM the whole field of nature one can select no more engaging study than that of bird migration. The brilliant colors, the sweet songs, and the interesting habits of birds enchant and invite to further study, but the mystery that enshrouds their travels will always hold us fascinated. The strange calls from the clouds at night, the passage of the well-formed flocks of ducks and geese by day, the flashing of new wings through the garden, and the return of familiar voices, inspire us to wonder at the power and precision of the guiding sense that draws birds back each year to their homes of the previous summer. Every August the bobolink, leaving the fields of New York State, travels five thousand miles to the pampas of Brazil and, with even greater punctuality, comes back the following May and hovers over the same fields and alights on the same fence posts.

It is not surprising that birds in migration have fascinated mankind, not surprising that governments employ scientists to study and investigate them, and little wonder that thousands of people, scientists and laymen, spend much time following the birds in an effort to learn their secret. The facts that have been discovered have relieved us of much of our ignorance, but the great mystery of how migration originated still remains, and at best we can offer but theories to account for it.

Let us first consider some of the more interesting phases of migration upon which modern investigation has thrown light.

It is now a matter of common knowledge that all birds do not migrate. Many species are able to accommodate themselves to the rigors of winter and never pass out of the neighborhood in which they are raised. The chickadees, the nuthatches, and the woodpeckers that come to feeding stations in winter in the northern United States, remain in the spring to nest in the vicinity, while in the south the familiar mockingbirds and cardinals are ever present. The farther south one goes, the larger is the proportion of non-migrant birds, until, in the tropics, probably no real migration occurs. Even there, however, the coming and going of our northern species are conspicuous features of the bird life, and there is probably no place in the world where migrating birds are never seen. In places of the same latitude, however, migration varies, reaching its maximum in the eastern United States and western Europe, and being much less pronounced in the southern than in the northern hemisphere.

Between the birds that do not migrate at all and the arctic tern, which migrates 10,000 miles twice a year between its antarctic wintering ground and the arctic shores where it nests, there are all gradations of migrants. Some birds, such as the meadowlark, the robin, the bluebird, and the chipping sparrow, which nest throughout most of the United States and Canada, merely withdraw into the southern part of their breeding range during the winter, while their places are taken by such birds as the tree sparrow, the snow bunting, the pine grosbeak, and the siskin, which nest in northern Canada and migrate in winter as far south as the northern United States. Other species that nest in the northern United States and Canada, such as most of the flycatchers, the warblers, and the vireos, pass out of the United States entirely and spend the winter in Central America or in northern South America. A few species, such as the bobolink, the nighthawk, and the golden plover, pass over the mountains of northern South America to winter on the pampas of Brazil and Argentina, while a few of the shore birds, the knot, and the yellowlegs, for example, wander to southern Patagonia.

One of the strangest features of the migrations of some of

these birds that winter in South America is that they pursue different routes in the spring from those in the fall. The golden plover, for example, which nests along the arctic coasts of North America, in the fall flies southeast to Labrador and thence due south to South America. A few stop along the Atlantic Coast, but the majority fly directly over the sea, a distance of about 2,400 miles, to the north coast of South America and thence to Argentina. At this time of year they are never seen in the Mississippi Valley. In the spring, however, they enter the United States along the Gulf Coast, and all migrate up the Mississippi Valley, at this season never being seen along the Atlantic Coast. But this double route is the exception. The vast majority of birds just move southward after the breeding season, following the routes where food is most abundant, shunning areas where food is scarce, until they finally reach their winter quarters. In the spring they move northward along the same highways.

The fall migration is marked by much more dallying than the spring, and by much more wandering, some birds delaying their actual migration by trips to north, east, or west. There is no hurry so long as food is abundant, and some birds, for example the snipe, the woodcock, and many species of ducks, remain until pressed for food by the killing frosts, or by the formation of ice over their feeding pools. Many species, however, start southward while food is still abundant.

The fact that so many species leave long before food becomes scarce makes the reason for their going the more strange and brings us to the questions of why they migrate, and how they know when it is time. The regularity with which birds arrive in the spring has been observed since ancient times, but it has not been until the modern investigations that we have understood the delicate physiological adjustment which records time for the bird almost as accurately as a timepiece. The physiological cycle is as precise in a healthy bird as is the revolution of the wheel of an engine. The bird's year begins with the slightest increase in the size of the reproductive organs, for these are not, as in some of the higher animals, of constant size throughout the year. The increase is a sign

that the breeding season is approaching, and with migrating species there comes the accompanying instinct to migrate, and the bird begins its journey to the breeding ground. If there were no such thing as weather, and if food were always equally abundant, the bird would arrive at its nesting ground on exactly the same day each year. Indeed this is said to be the case with some of the sea birds, notably the puffins, which are little affected by the weather. They spend the greater part of the year at sea, but each year on exactly the same day they appear on their breeding islands.

The first birds to come in the spring are the least punctual, because in the early spring the weather is least settled. The later migrants become more and more punctual as the weather becomes more uniform until with those birds coming after the first of May we can prophesy the day of their arrival at any place with considerable accuracy.

If birds had no enemies and always hatched their first eggs successfully, it is probable that the fall migration would be as regular as the spring, because after the breeding season the reproductive organs begin to decrease in size just as they grew in the spring. But many birds have to make several attempts before they raise a brood successfully, and while they are still feeding their young in the nest, others of their species are ready to leave. Some species, however, wait for a second or even a third brood, but the majority are ready after the first brood to enter once more upon a care-free existence. Some species, for example the swallows and the blackbirds, assemble in large, conspicuous flocks before migrating; but others slip away unnoticed, usually the old birds first, followed later by the young. It is the periodic changes in the reproductive organs, then, that tell birds when to migrate and the attendant instinct that impels them to go.

But this does not explain how and why birds came to migrate in the first place. It may explain how the instinct is maintained, but not how it has been developed. For this we have to resort to hypotheses. Without going into detail it may be interesting to review the one that receives greatest credence to-day. It is founded on two beliefs that we now look on almost

as facts: first, the origin of bird life on this continent, and second, the coming of a glacial period, or ice age, when most of the birds were driven out.

In North America it is undoubtedly true that we have received our birds from two sources—from South America and from Asia by way of Alaska. We know this because some of our species are almost identical with those of Europe and Asia, while others are very similar to South American forms found nowhere else in the world. If we can imagine the South American birds, in ages past, gradually spreading northward because of an overcrowded condition or because of the natural instinct inherent in most organisms to cover as much territory as possible, we would find them eventually coming into a land which, while similar to that of their progenitors during a part of the year, was entirely different during winter and unsuited to their needs. They were, therefore, able to occupy it only during the summer months and each winter had to retire southward. This would have been sufficient eventually to form a migrating instinct of considerable power and regularity, but it does not explain all the variations in route and distance traveled, which we see to-day.

During the numerous geological ages that have ensued since birds first came into North America, the continent and the climate have seen great changes. North America has changed from a mild, semi-tropical land to one covered with snow and ice and back again to a land of decided seasons. If we think of birds as having become established during the semi-tropical times, even without any decided migrations, we can still think of them as developing this instinct to migrate under the stress of the slowly approaching ice stage, the birds being driven southward to seek quarters in already overcrowded tropics and striving northward with each returning spring and recession of the glaciers, only to be forced back again the following winter.

One might follow this thought in great detail and show how the various routes followed by birds between North and South America may have been evolved, but we cannot take space for

it here. There remains one other problem, which seems even more mysterious, and that is, how birds find their way.

Each year the bobolink after traveling 10,000 miles comes back to the same meadow, and the oriole comes back to the same tree. The robin and the phoebe come back to their former nests and construct others close by or even on top of the old structures. What is it that guides them on their long journey and brings them back so precisely? It is instinct we now say, a sense which, not having ourselves, we are unable to understand. That sense which directs the carrier pigeon back to the home loft five days' journey distant is probably the same that guides all birds on their migrations, and we call it a *sense of direction*. There have been numerous observations to support this theory. Some modern experiments on terns carried in the hold of a ship 1,000 miles out of the range of the species, which, when released, flew back directly to their nests, have conclusively shown that birds do have this sense. But just what this sense is and what controls it, we have yet to learn.

DIRECTIONS FOR KEEPING A BIRD CALENDAR

The greatest value in keeping a bird calendar is in stimulating to greater powers of observation. The stimulation that you receive to be wide-awake to everything that is going on about you will stand by you in any walk of life. But inaccurate observation is worse than no observation, for great harm can come from it. Great care should be exercised to verify the reports so that no mistaken observations will appear on the chart. If an atmosphere of accuracy is created about the calendar, the study of the sciences later on will not be the bugbear that it is to some children.

In order to verify the first record, it is well to keep the second record, so that if too great discrepancy occurs between the first record and the average date of arrival, the second date can be retained instead.

The calendar should have at least four columns: the first for the name of the bird, the second for the date, the third for the locality where it was seen, and the last for the date of the



CHICKADEE AND WHITE-BREASTED NUTHATCH.

second arrival. If the calendar is being compiled from the observations of several persons, it is well to add a fifth column in which the name of the discoverer can be written.

A space devoted to recording the date the bird is last seen each year, might stimulate a little interest in the fall migration of birds, which usually passes unnoticed.

NOTE.—For the average date of the arrival of birds at any given place, write to the State Department of Agriculture at the capitol of the State in which the place is located.

THE MATING OF THE BIRDS

By W. J. CLAXTON

There's a merry brown thrush sitting up in a tree
He's singing to me! He's singing to me!
And what does he say, little girl, little boy?
"Oh, the world's running over with joy!
Don't you hear? Don't you see?
Hush! Look! In my tree
I'm as happy, as happy as can be!"

—From *The Brown Thrush*,
By LUCY LARCOM.

YOU must have noticed at some time or other a little of bird courtship. There sits the demure little female on some branch, looking the most unconcerned creature in the world, notwithstanding the fact that there will probably be four or five ardent "swains" on a neighboring branch trying to capture her attention, and "get into her good books." They are keen rivals, and they all have a desire to "show off," as boys say. Perhaps her choice will fall on the one with the strongest and clearest voice. She is often a long time making up her mind, and, like her human counterpart, she is sometimes fickle and extremely hard to please.

Often the rivals have to settle matters by having a fight. Never did knight of old strive harder for the graces of his lady-love than do the male birds when trying to capture the hearts of their chosen mates. The fight is long and terrible: feathers fly; wings beat each other's bodies; beaks and claws

continue the duel to the bitter end. The victor takes the spoils, and proudly marches off with his hardily-won bride to their new home. The honeymoon is all too brief: hard work, in the shape of nest-building, bringing off the eggs, and tending the baby birds is their lot, and right well do they fulfill it. "Love melts the universal lay," and all is merry and well with them.

But it is not only by the power of song, or the ability to fight, that the birds woo and capture their mates. All have not voices. If they have not, Nature generally compensates them by giving them beautiful plumage, and in nearly every case it is the male bird which is most beautifully marked. These birds strut about with their breasts thrown out and their heads set high. "All swank," you would probably remark if you saw a gaudy peacock wheeling around the peahen, or the farmyard cock among the fowls. No dancing-master ever set such mincing steps, or pirouetted around the hall so nimbly and gracefully as these dandies in bird-land.

I think it was the poet Cowper who wrote the following lines about the birds' beautiful plumage:—

The birds put off their every hue
To dress a room for Montague,
The peacock sends his heavenly dyes,
His rainbows and his starry eyes;
The pheasant, plumes which round enfold
His mantling neck with downy gold;
The cock, his arched tail's azure show,
And, river blanchèd, the swan his snow.

Have you ever heard of the Australian bower-bird? There are many varieties of these birds, such as the satin bower-bird, so called on account of its black, glossy plumage, resembling satin; the spotted bower-bird, which is not quite so brightly marked, and several others. They are not very large birds—they generally measure about a foot in length—and they are members of the starling family.

These birds are very practical in their manner of wooing. When "sweethearting" commences they construct a beautiful bower on the ground in a lonely part of the forest. These bowers are cleverly designed and are most elaborately decorated with shells, pebbles, feathers, etc. An entrance is made

at each end, and several paths lead up to the bower. When the building has been erected and suitably furnished, the male entices his chosen mate inside. He shows her round, but she may not like the work of her swain. He may have been too niggard in his work; another male which she knows near by is far more lavish in his expenditure; she will visit him before making her choice. Accordingly she goes the round until her mind is finally made up. The bower will not be used for nesting purposes. It is simply my lady's "boudoir," or a retreat for amusement, etc.

In birddom there are many broken hearts, as some of the gay old males are very fickle, and desert their "wives." A fine example, though, of constancy in "married" life is that of the despised crow. This bird selects his mate and "sticks to her" through life, until death parts them.

THE WAY THE SCIENTISTS GROUP THE BIRDS

By J. ELLIS BURDICK

THE wise men who study the creatures of the earth have found that all the living creatures of the world can be divided into two big divisions. One of these is called "Invertebrates," because these creatures have no spine; butterflies, oysters, earth-worms, and star-fish are some of the invertebrates. The other division is called "vertebrates," because these creatures do have spines; frogs and toads, lizards and snakes, alligators and crocodiles, turtles and tortoises, fishes, birds, and the mammals are vertebrates.

Now, there are different kinds of birds, as you well know. The ornithologists, as those people who study birds are called, have divided the birds of America into seventeen groups or orders. Each of these orders is divided into families. Then the families are divided into species. Sometimes the families are divided into smaller groupings called sub-families. The

ornithologists have given to each of these groups a scientific name, made from Latin or Greek words which indicate the characteristics of the birds in the groups. The following list shows the relationship existing between these different groups, and the scientific name of each. The Roman numeral indicates the orders; the Arabic numeral, the family; and the letters, the sub-family.

I.—DIVING BIRDS (*Dygopodes*)

These are the birds which are nearest like the reptiles. Their bodies are so formed, and their legs are so short, that it is almost impossible for them to walk on land. When they try to do so, they generally push themselves along flat on the ground like a snake.

1. Grebes (*Colymbidæ*)
2. Loons (*Gaviidæ*)
3. Auks, Murres, and Puffins (*Alcidæ*)

II.—LONG-WINGED SWIMMERS (*Longipennes*)

These birds are generally seen on the wing over or near water.

1. Skuas and Jaegers (*Stercorariidæ*)
2. Gulls and Terns (*Laridæ*)
3. Skimmers (*Rynchopidæ*)

III.—TUBE-NOSED SWIMMERS (*Tubinares*)

The birds of this order have nostrils which open through tubes.

1. Albatrosses (*Diomedeidæ*)
2. Fulmars, Shearwaters, and Petrels (*Procellariidæ*)

IV.—TOTI-PALMATED SWIMMERS (*Steganopodes*)

The birds grouped under this name have feet with webs all (*toti*) between the toes, making the foot like the palm of the hand (*palmated*).

1. Tropic Birds (*Phæthontidæ*)
2. Gannets (*Sulidæ*)
3. Darters (*Anhingidæ*)
4. Cormorants (*Phalacrocoracidæ*)
5. Pelicans (*Pelecanidæ*)
6. Man-o'-war-birds (*Fregatidæ*)

V.—LAMELLIROSTRAL SWIMMERS (*Anseres*)

These swimmers have grooves along the edges of their bills.

1. Ducks, Geese and Swans (*Anatidæ*)
 - a. Mergansers (*Merginæ*)
 - b. River Ducks (*Anatinæ*)
 - c. Sea Ducks (*Fuligulinæ*)
 - d. Geese (*Anserinæ*)
 - e. Swans (*Cygninæ*)

VI.—LAMELLIROSTRAL WADERS (*Odontoglossæ*)

In the five orders above the birds have short legs. In this sixth order we have birds with bills and feet like those in the fifth order, but with very long legs.

1. Flamingoes (*Phænicopteridæ*)

VII.—HERONS, STORKS, IBISES (*Herodiones*)

Here are grouped the long-legged wading birds generally found along the shores or on muddy flats. They have no webs between their toes.

1. Spoonbills (*Plataleidæ*)
2. Ibises (*Ibididæ*)
3. Storks and Wood Ibises (*Ciconiidæ*)
4. Herons, Bitterns, and Egrets (*Ardeidæ*)

VIII.—MARSH-DWELLERS (*Paludicolæ*)

Birds of this order always live in marshy places. They have four toes, arranged like those of a hen—the back one raised.

1. Cranes (*Gruidæ*)
2. Courlans (*Aramidæ*)
3. Rails, Gallinules, and Coots (*Rallidæ*)

IX.—SHORE-BIRDS (*Limicolæ*)

Shore-birds are so named because they are almost always found in open places along streams of water and on the open beaches.

1. Phalaropes (*Phalaropodidæ*)
2. Avocets and Stilts (*Recurvirostradæ*)
3. Snipes and Sandpipers (*Scolopacidæ*)
4. Plovers (*Charadriidæ*)
5. Surf-birds and Turnstones (*Aphrizidæ*)
6. Oyster-catchers (*Hæmatopodidæ*)

X.—HEN-LIKE BIRDS (*Gallinæ*)

The birds of this order live on the ground—make their nests there and find almost all their food there. They are shaped like the common barn-yard fowls, and their habits are much the same.

1. Bob-whites and Quails (*Odontophoridæ*)
2. Grouse, Spruce Partridges, and Ptarmigans (*Tetraonidæ*)
3. Turkeys (*Meleagridæ*)
4. Pheasants (*Phasianidæ*)

XI.—PIGEONS AND DOVES (*Columbæ*)

In drinking, a pigeon immerses the bill to the nostril and draws in the water in a continuous draft. So far as any one knows, no other bird drinks in this manner.

1. Pigeons and Doves (*Columbidæ*)

XII.—BIRDS OF PREY (*Raptores*)

All the families found in this order have one general characteristic—that of feeding on other animals.

1. Vultures (*Cathartidæ*)
2. Hawks, Eagles, and Kites (*Buteonidæ*)

3. Falcons and Caracaras (*Falconidæ*)
4. Ospreys (*Pandionidæ*)
5. Barn Owls (*Aluconidæ*)
6. Horned Owls (*Strigidæ*)

XIII.—PARROT-LIKE BIRDS (*Psittaci*)

Hooked bills and yoked-toes—two toes turned forward and two turned backward—are the tell-tale marks of this order.

1. Parrots and Parrakeets (*Psittacidæ*)

XIV.—CUCKOOS, TROGONS, AND KINGFISHERS (*Coccyges*)

In this order are found three families of birds that have very little outward resemblance to each other. One man said it looked to him as if the wise men had these three families left over when they finished classifying the birds, and, not knowing what to do with them, bunched them in one order; but, of course, he had not examined their skeletons as the scientists had and did not know that they were alike.

1. Cuckoos, Anis, and Roadrunners (*Cuculidæ*)
2. Trogons (*Trogonidæ*)
3. Kingfishers (*Alcedinidæ*)

XV.—WOODPECKERS (*Pici*)

These are the carpenters of Birdland.

1. Woodpeckers (*Picidæ*)

XVI.—LONG-HANDED BIRDS (*Macrochires*)

A bird's wing has three parts, just like the human arm and hand. In this order the birds have the hand part of the wing very long.

1. Goatsuckers (*Caprimulgidæ*)
2. Swifts (*Micropodidæ*)
3. Hummingbirds (*Trochilidæ*)

XVII.—PERCHING BIRDS (*Passeres*)

Last and not least but greatest of the orders is that of the Perching Birds. These birds usually have four toes which are so arranged that the bird can grasp a branch or some other perch. In this order bird-life reaches its highest development—the nervous system is acutely sensitive; the senses of hearing and sight are keenly developed; the circulation of the blood and the breathing are rapid; and the temperature of the body is the highest of the animals.

1. Tyrant Flycatchers (*Tyrannidæ*)
2. Larks (*Alaudidæ*)
3. Crows, Jays, and Ravens (*Corvidæ*)
4. Starlings (*Sturnidæ*)
5. Blackbirds, Grackles, and Orioles (*Icteridæ*)
6. Finches (*Fringilliadæ*)
7. Tanagers (*Tangaridæ*)
8. Swallows (*Hirundinidæ*)
9. Waxwings (*Bombycillidæ*)
10. Silky Flycatchers, (*Ptilogonatidæ*)
11. Shrikes (*Laniidæ*)

PERCHING BIRDS, *continued*

12. Vireos (*Vireonidæ*)
13. Warblers (*Mniotiltidæ*)
14. Wagtails (*Motacillidæ*)
15. Dippers (*Cinclidæ*)
16. Mimic Thrushes (*Mimidæ*)
17. Wrens (*Troglodytidæ*)
18. Creepers (*Certhiidæ*)
19. Nuthatches (*Sittidæ*)
20. Titmice (*Paridæ*)
21. Wrens-Tits (*Chamæidæ*)
22. Kinglets and Gnatcatchers (*Sylviidæ*)
23. Thrushes (*Turdidæ*)

IDENTIFICATION OF THE BIRDS

IN order to know the name of the bird he has seen, the bird-lover does not want to shoot it that he may observe whether it has four or three toes, how these are arranged, how many feathers are in the tail, how many primary or how many secondary feathers in the wing, or any of the other characteristics that can only be seen with the specimen in the hand. For the ordinary bird-loving student a color key, a scale of comparative sizes, a note-book, and a book of reference are all that are necessary. A good museum of easy access is a very great help—because there he can verify his observations.

The following keys refer to birds in the United States and Canada. To use them: First, ask the question, "Is it a land bird or a water bird?" The place where it was seen will answer this question. Second, note the prevailing color or colors—black, black and white, black and red, red, purple, or whatever it may be. Third, if it is a water bird, how does it compare in size with the ordinary duck? If it is a land bird, how does it compare with the robin or the crow? Having noted these points in the note-book, a hasty glance at the corresponding section of the Color Keys will show what birds it *might* have been. Next, look in the index of the reference book for the pages on which you will find described these possibilities. In this way you will gradually narrow the search down to the bird you saw.

The warblers are so numerous, it seemed best to separate them from the other land birds and to give them a key all their own.

COLOR KEY TO WATER BIRDS

BLACK

Size of Duck or Larger

Sooty Shearwater	Black Duck
Water Turkey	Florida Duck
Cormorant	Scoter
Double-crested Cormorant	White-winged Scoter
Brandt's Cormorant	Surf Scoter
Man-o'-war-bird	Black-footed Albatross

Smaller than Duck

Fork-tailed Petrel	Black Tern
Least Petrel	Black Rail
Kaeding's Petrel	Coot
Storm Petrel	Black Oyster-catcher
Wilson's Petrel	

BLACK AND WHITE

Size of Duck or Larger

Western Grebe	Labrador Duck
Loon	Steller's Eider
Black-throated Loon	Spectacled Eider
Murre	Northern Eider
California Murre	Eider
Brünnich's Murre	King Eider
Razor-billed Auk	Canada Goose (back brown)
Great Auk	Hutchins's Goose (back brown)
Great Black-backed Gull	White-cheeked Goose (back brown)
Black Skimmer	Cackling Goose (back brown)
Laysan Albatross	Brant (back brown)
Scaup Duck	Black Brant (back brown)
Lesser Scaup Duck	Merganser
Ring-necked Duck	Hooded Merganser (head green)
Golden-eye (head purple)	Mallard (head green)
Barrow's Golden-eye (head greenish)	Shoveller (head green)
Buffle-head	Old-squaw
Harlequin Duck	Yellow-crowned Night Heron

Smaller than Duck

Horned Grebe	Black Guillemot
Eared Grebe	Pigeon Guillemot
Tufted Puffin	Dovekie
Puffin	Pomarine Jaeger
Cassin's Auklet	Parasitic Jaeger
Crested Auklet	Long-tailed Jaeger
Least Auklet	Sooty Tern
Ancient Murrelet	Greater Shearwater

Leach's Petrel	Purple Sandpiper
Black-crowned Night Heron	Aleutian Sandpiper
Black-necked Stilt	Pribilof Sandpiper
Black-bellied Plover	Greater Yellow-legs
Golden Plover	Yellow-legs
Oyster-catcher	Solitary Sandpiper
Black Turnstone	Western Solitary Sandpiper

BLACK, RED, AND WHITE

Size of Duck or Smaller

Holboell's Grebe	Redhead
Red-throated Loon	Canvas-back
Red-breasted Merganser	Red Phalarope
Wood Duck	Red-backed Sandpiper

WHITE

Size of Duck or Larger

Ivory Gull	Trumpeter Swan
Glaucous Gull	Roseate Spoonbill
Glaucous-winged Gull	White Ibis
Yellow-billed Tropic-bird	Wood Ibis
Red-billed Tropic-bird	Great White Heron
Gannet	Egret
Snow Goose	Whooping Crane
Greater Snow Goose	White Pelican
Whistling Swan	

Smaller than Duck

Ross's Gull	Little Blue Heron (white phase)
Snowy Egret	Avocet (primaries black)

BROWNISH

Size of Duck or Larger

Skua	White-fronted Goose
Booby (whitish below)	Limpkin
Brown Pelican	

Smaller than Duck

Bittern	Noddy
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BROWNISH, MIXED OR STREAKED WITH YELLOWISH
OR WHITE

(Usually lighter below)

Size of Duck or Larger

Gadwall	Baldpate
European Widgeon	Pintail

Smaller than Duck

Cory's Shearwater	Baird's Sandpiper
Least Bittern	Least Sandpiper
King Rail	Semipalmated Sandpiper
California Clapper Rail	Western Sandpiper
Clapper Rail	Marbled Godwit
Louisiana Clapper Rail	Pacific Godwit
Caribbean Clapper Rail	Hudsonian Godwit
Virginia Rail	Willet
Sora	Western Willet
Yellow Rail	Upland Plover
Woodcock	Buff-breasted Sandpiper
Wilson's Snipe	Spotted Sandpiper
Dowitcher	Hudsonian Curlew
Long-billed Dowitcher	Long-billed Curlew
Stilt Sandpiper	Eskimo Curlew
Pectoral Sandpiper	Turnstone
White-rumped Sandpiper	Ruddy Turnstone

RED

Larger than Duck

Flamingo

BLUISH-GRAY ABOVE, WHITE BELOW

Size of Duck or Larger

Herring Gull	Pacific Fulmar
California Gull	Blue Goose
Ring-billed Gull	Emperor Goose
Fulmar	Great Blue Heron

Smaller than Duck

Kittiwake	Cabot's Tern
Pacific Kittiwake	Forster's Tern
Laughing Gull (head black)	Common Tern
Franklin's Gull (head black)	Arctic Tern
Bonaparte's Gull	Roseate Tern
Sabine's Gull (head black)	Least Tern
Heermann's Gull (head white)	Northern Phalarope
Gull-billed Tern	Sanderling
Caspian Tern	Knot (breast chestnut)
Royal Tern	Surf-bird

All the Terns in this group have the crown black

SLATE-GRAY

Larger than Duck

Little Brown Crane	Sandhill Crane
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Smaller than Duck

Florida Gallinule	Little Blue Heron (dark phase)
Louisiana Heron (white below)	

CHESTNUT

Size of Duck or Larger

Green-winged Teal (back mottled gray and white, breast spotted with black)	Ruddy Duck (crown black, cheeks and chin white)
Blue-winged Teal (head gray, white crescent in front of eye)	Glossy Ibis (back iridescent blackish)
Cinnamon Teal (back mottled with dusky brown)	White-faced Glossy Ibis (back iridescent blackish, face white)

GREENISH

Smaller than Duck

Green Heron (throat streaked with dark chestnut)

GRAYISH-BROWN ABOVE, WHITE BELOW

Smaller than Duck

Semipalmated Plover	Mountain Plover
Ringed Plover	Killdeer (two black bands on breast)
Piping Plover	Wilson's Phalarope (neck rufous)
Snowy Plover	
Wilson's Plover	

PURPLE

Smaller than Duck

Purple Gallinule

COLOR KEY TO LAND BIRDS

BLACK

Size of Crow or Larger

California Vulture	Dusky Grouse
Wild Turkey	Franklin's Grouse
Black Vulture	Bald Eagle (young)
Raven	Black Gyrfalcon
White-necked Raven	Everglade Kite
Rough-legged Hawk	Audubon's Caracara
Zone-tailed Hawk	Fish Crow
Crow	Hudsonian Spruce Partridge

Size between Crow and Robin

Ivory-billed Woodpecker	Rusty Blackbird
Lewis's Woodpecker	Pileated Woodpecker
Groove-billed Ani	Boat-tailed Grackle
Purple Grackle	Starling
Brewer's Blackbird	

Smaller than Robin

Purple Martin
Cowbird
Red-eyed Cowbird
Phainopepla

Catbird
Black Swift
Dipper

BLACK AND WHITE

Size of Crow or Larger

Bald Eagle
Swallow-tailed Kite

Duck Hawk
Osprey

Size between Crow and Robin

Magpie
Nighthawk

Pigeon Hawk

Smaller than Robin

Hairy Woodpecker
Black-headed Grosbeak
Downy Woodpecker
Texas Woodpecker
White-headed Woodpecker
Williamson's Sapsucker
Towhee
Arctic Towhee
Snow Bunting
Slate-colored Junco
Seaside Sparrow
Barn Swallow

Arctic Three-toed Woodpecker
Three-toed Woodpecker
Ant-eating Woodpecker
Nuttall's Woodpecker
Red-cockaded Woodpecker
Kingbird
Bobolink (male, summer)
Black Phoebe
Cliff Swallow
Lark Bunting
White-throated Swift

BLACK AND RED

Smaller than Robin

Red-winged Blackbird
Bicolored Red-wing
Scarlet Tanager

Western Tanager
Painted Redstart

BLACK, RED, AND WHITE

Size of Robin

Rose-breasted Grosbeak
Red-headed Woodpecker
Red-bellied Woodpecker
Golden-fronted Woodpecker

Gila Woodpecker
Tricolored Red-wing
Red-breasted Sapsucker

BLACK AND ORANGE

Smaller than Robin

Baltimore Oriole

BLACK AND YELLOW

Size of Robin

Audubon's Oriole	Yellow-headed Blackbird
Bullock's Oriole	Evening Grosbeak
Scott's Oriole	Meadowlark (brown above)
Sennett's Oriole	Western Meadowlark (gray above)
Yellow-bellied Sapsucker	

Smaller than Robin

Goldfinch	Arkansas Goldfinch
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BLACK AND BROWN

Smaller than Robin

Orchard Oriole

WHITE

Size of Crow or Larger

White Gyr Falcon	White-tailed Kite (upper parts pale-gray, shoulders black)
Snowy Owl	

Size between Crow and Robin

Willow Ptarmigan (winter)	White-tailed Ptarmigan (winter)
Rock Ptarmigan (winter)	

Smaller than Robin

Snow Bunting (some brownish)

BROWNISH

Size of Crow or Larger

Golden Eagle	Ruffed Grouse
Turkey Vulture	Spotted Owl
Great Horned Owl	Marsh Hawk (young, rump white)

Size between Crow and Robin

Chuck-will's-widow	Whip-poor-will
Sparrow Hawk	Mourning Dove
Boat-tailed Grackle (female)	California Thrasher

Smaller than Robin

Cañon Towhee	Bohemian Waxwing
Abert's Towhee	Gray-crowned Rosy Finch
European Goldfinch (face red, wing-patch yellow)	Carolina Wren
Olive-sided Flycatcher (streaked above and below)	House Wren
Crested Flycatcher	Winter Wren
Chimney Swift	Brown Creeper (streaked lengthwise with lighter)
Vaux's Swift	Say's Phoebe
Cedar Waxwing	Bank Swallow
	Rough-winged Swallow

BROWNISH, MIXED OR STREAKED WITH YELLOWISH
OR WHITE

(Usually lighter below)

Size of Crow or Larger

Goshawk (young)	Road-runner
Red-tailed Hawk	Prairie Chicken
Harris's Hawk	Heath Hen
Red-shouldered Hawk	Sage Hen
Swainson's Hawk	Sharp-tailed Grouse
Rough-legged Hawk (light phase)	Barred Owl
Gyr Falcon	Long-eared Owl
Prairie Falcon	Short-eared Owl
Broad-winged Hawk	Barn Owl

Size between Crow and Robin

Cooper's Hawk (young)	Rock Ptarmigan (summer)
Pigeon Hawk (young)	White-tailed Ptarmigan (summer)
Sharp-shinned Hawk (young)	Bob-white
Hawk Owl	Masked Bob-white
Saw-whet Owl	Mearns's Quail
Richardson's Owl	Poor-will
Burrowing Owl	Brown Thrasher
Screech Owl	Flicker (transversely barred with black on back)
Willow Ptarmigan (summer)	

Smaller than Robin

Red-winged Blackbird (female)	Field Sparrow
Bobolink (male in autumn, fe- male, and young)	Pine-woods Sparrow
Williamson's Sapsucker (female)	Song Sparrow
Pygmy Owl	Lincoln's Sparrow
Elf Owl	Vesper Sparrow
Coues's Flycatcher	Swamp Sparrow
Purple Finch (female)	Fox Sparrow
House Finch	Skylark
Redpoll	Pipit
Pine Siskin	Sage Thrasher
Lapland Longspur	Cactus Wren
Ipswich Sparrow	Rock Wren
Savannah Sparrow	Bewick's Wren
Grasshopper Sparrow	Short-billed Marsh Wren
Henslow's Sparrow	Long-billed Marsh Wren
Sharp-tailed Sparrow	Wren-Tit
Lark Sparrow	Wood Thrush
Harris's Sparrow	Veery
White-crowned Sparrow	Gray-cheeked Thrush
White-throated Sparrow	Olive-backed Thrush
Golden-crowned Sparrow	Russet-backed Thrush
Tree Sparrow	Hermit Thrush
Chipping Sparrow	Ground Dove
	Inca Dove

RED

Size of Robin or Smaller

Cardinal	Purple Finch (male)
Summer Tanager	Varied Bunting (forehead and
Crossbill	rump blue)
White-winged Crossbill	Painted Bunting
Pine Grosbeak (upper parts gray)	

BLUE

Size between Crow and Robin

Arizona Jay	Woodhouse's Jay (below gray)
Florida Jay	Steller's Jay (head black)
California Jay (below white)	Blue Jay

Smaller than Robin

Bluebird (breast rufous)	Blue Grosbeak
Mountain Bluebird (white below)	Indigo Bunting (male)
Western Bluebird (breast and back rufous)	Lazuli Bunting (male)

GREEN

Size between Crow and Robin

Carolina Paroquet	Coppery-tailed Trogon
Thick-billed Parrot	Green Jay

Smaller than Robin

Rivoli's Hummingbird	Anna's Hummingbird
Ruby-throated Hummingbird	Broad-tailed Hummingbird
Blue-throated Hummingbird	Rufous Hummingbird
Black-chinned Hummingbird	

GREEN AND WHITE

Smaller than Robin

Texas Kingfisher	Tree Swallow
Violet-green Swallow	

GRAYISH

*(Usually lighter below)**Size of Crow or Larger*

Mississippi Kite (ashy below)	Goshawk (finely barred below)
Great Gray Owl	Sennett's White-tailed Hawk
Marsh Hawk (rump white)	(shoulders rufous)

Size between Crow and Robin

Clarke's Nutcracker	Screech Owl (gray phase)
Sharp-shinned Hawk (rufous, barred below)	Yellow-billed Cuckoo
Cooper's Hawk (rufous, barred below)	Black-billed Cuckoo
	Canada Jay

Size of Robin or Smaller

Robin (rufous below)	Arizona Pyrrhuloxia (crimson in center below)
Bendire's Thrasher	Bell's Sparrow
Leconte's Thrasher	Dickcissel
Crissal Thrasher	Warbling Vireo
Mockingbird	Philadelphia Vireo
Northern Shrike	Black-capped Vireo
Loggerhead Shrike	Bell's Vireo
Townsend's Solitaire	Tufted Titmouse
Scissor-tailed Flycatcher	Bridled Titmouse
Gray Kingbird	Black-crested Titmouse
Phoebe	Chickadee
Wood Pewee	Mountain Chickadee
Western Wood Pewee	Hudsonian Chickadee
Least Flycatcher	Acadian Chickadee
Yellow-bellied Flycatcher	Chestnut-backed Chickadee
Horned Lark	Bush-Tit
Black-chinned Sparrow	Verdin
Black-throated Sparrow	

BLUISH-GRAY

(Lighter below)

Size between Crow and Robin

Band-tailed Pigeon	Gambel's Quail
Passenger Pigeon (rufous below)	Belted Kingfisher
White-winged Dove	Piñon Jay
Mountain Quail	Varied Thrush (below rusty, black chest-band)
California Quail	
Scaled Quail	

Smaller than Robin

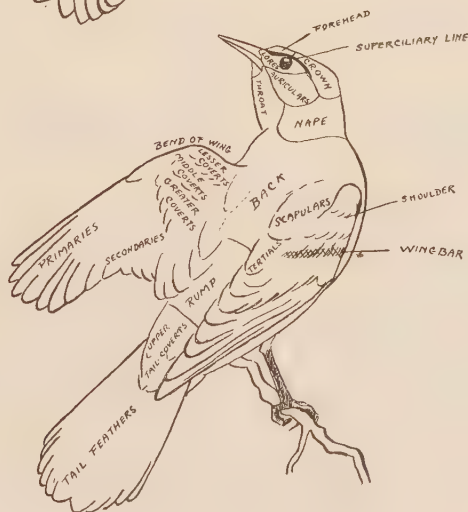
Red-breasted Nuthatch (rufous below)	Pygmy Nuthatch
Brown-headed Nuthatch	White-breasted Nuthatch
	Blue-gray Gnatcatcher

GREENISH-GRAY

(Usually white or yellowish below)

Size of Robin or Smaller

Arkansas Kingbird	White-eyed Vireo
Green-tailed Towhee (crown rufous)	Ruby-crowned Kinglet
Texas Sparrow (crown brown, white center stripe)	Golden-crowned Kinglet
Yellow-throated Vireo	Alder Flycatcher
Red-eyed Vireo	Trail's Flycatcher
Blue-headed Vireo	Acadian Flycatcher
	Western Flycatcher
	Yellow-bellied Flycatcher



Drawing by Henry Thurston.

TOPOGRAPHY OF A BIRD.

COLOR KEY TO WARBLERS

BLACK AND WHITE STRIPED

Black and White Warbler
Myrtle Warbler

Black-poll Warbler
Audubon's Warbler

BLACK AND RED

Redstart

BLACK AND YELLOW

Townsend's Warbler
Golden-cheeked Warbler
Blackburnian Warbler

Hermit Warbler
Magnolia Warbler

BLACK AND GRAY

Golden-winged Warbler

Black-throated Gray Warbler

BLACK, GRAY, AND YELLOW

Yellow-throated Warbler

Grace's Warbler

YELLOW

Prothonotary Warbler
Cape May Warbler
Wilson's Warbler

Blue-winged Warbler
Yellow Warbler

OLIVE ABOVE, YELLOW BELOW

Yellow-breasted Chat
Maryland Yellow-throat
Mourning Warbler
Ovenbird
Black-throated Green Warbler
Olive Warbler
Hooded Warbler
Belding's Yellow-throat

Macgillivray's Warbler
Kentucky Warbler
Yellow Palm Warbler
Kirtland's Warbler
Prairie Warbler
Lawrence's Warbler
Black-throated Blue Warbler
(female)

OLIVE ABOVE, WHITE BELOW

Chestnut-sided Warbler

DUSKY OLIVE ABOVE, WHITISH OR YELLOWISH BELOW

Swainson's Warbler
Tennessee Warbler
Pine Warbler
Louisiana Water-Thrush
Bay-breasted Warbler

Worm-eating Warbler
Nashville Warbler
Water-Thrush
Connecticut Warbler

GRAY ABOVE, WHITE BELOW

Brewster's Warbler
Virginia's Warbler

Lucy's Warbler
Parula Warbler

GRAY ABOVE, YELLOW BELOW

Canada Warbler

BLUE ABOVE, WHITE BELOW

Cerulean Warbler

BLUE AND BLACK, WHITE BELOW

Black-throated Blue Warbler (male)

The note-book should be marked as follows, or in some very similar manner:

Date—Month, day, and year when observed.

Size—As directed above.

Description—See the accompanying chart of the Topography of a Bird and the drawings of tails, feet, and bills.

General Color above

General Color below

Forehead

Crown

Nape

Back

Rump

Chin

Throat

Lores

Breast

Abdomen

Tail: Color

Shape

Bill: Color

Shape

Wing: Color

Shape

Feet: Color

Arrangement of toes

Movements—Hop, run, bob head or tail or both, sit quietly or flit about continuously, nervous or deliberate.

Flight—Direct, zigzagging, diving, sailing, wavy, or combinations of these.

Song—Harsh, sweet notes long drawn out or in series, variety of notes, one or more calls, call in flight or at rest or both; what does the bird seem to say in our words?

Habitat—Trees (high up or low down), shrubs, ground, buildings, water.

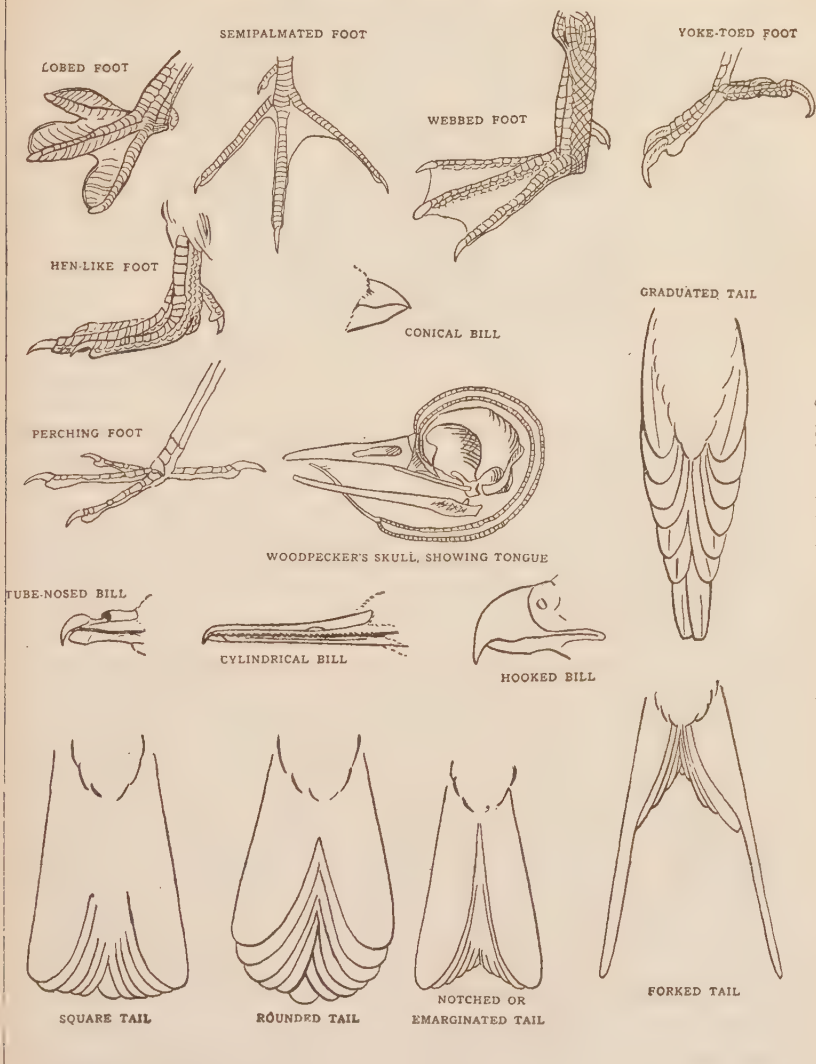
Localities Frequented—Meadows, forests, orchards, homes, foot-hills.

Food—Insects, grain, fruit, seeds, vegetables.

Economic Value—Is this bird useful or useless?

Remarks—Points not covered by this outline.

From these observations, stories can be written like those on the following pages.



Drawn by Henry Thurston.

THE ROBIN

From THE CORNELL RURAL SCHOOL LEAFLET

Rollicking robin is here again;
What does he care for the April rain?
Care for it? Glad of it. Doesn't he know
That the April rain carries off the snow,
And coaxes out leaves to shadow his nest,
And washes his pretty red Easter vest,
And makes the juice of the cherry sweet,
For his little hungry robins to eat?
"Ha! ha! ha!" hear the jolly bird laugh
"That isn't the best of the story by half!"

—From *Sir Robin*,
By LUCY LARCOM.

The robin belongs to the order of Perching Birds, and the family of Thrushes. Its scientific name is *Planesticus migratorius*. It ranges throughout North America from the southern end of the Mexican tableland northward to the limit of trees in Labrador and from there to Alaska. In this great area it has three geographical varieties: the eastern or common robin, which is described below; the western robin, which is like the eastern bird, but has little or no white in the tail and no black markings on the back; and the southern robin, which is smaller and paler than the northern bird.

ICY drifts still fill the shaded fence rows and the chill north wind still speaks of snow and winter. Three times the ice has stilled the noisy frogs, three times the whitened marsh has shown brown by noon, and now by the laws of the sages spring should be here. A peeper chirps in a neighboring pond; a chickadee gives his *phæbe* note; a nuthatch rolls his spring-time call; and there in the orchard on a topmost branch appears the robin. "Good luck," they say, "to see him first on highest branch." Good luck to see him anywhere! Never so rich am I as after seeing the first robin; then home with the glad tidings! "The robin has come and spring is here!" Watch him as he flies to the sun-warmed spot where perchance an early worm may be found. How brilliant is his chestnut breast, how green the grass, how soft the air! We overlook the stubborn drifts, we forget the icy crystals fringing yonder pond. All is changed, and the robin has changed it.

Through the long winter he has been with flocks of his fellows in the sunny southland, feeding on berries of mistletoe and holly, and now he is back once more with an appetite for grubs and worms. Occasionally he passes the winter in the chill north, if he can find a sheltered spot with berries of cedar, grape, or mountain ash; but usually he leaves in October for the land of plenty. With the first signs of spring, however, back he flies, the harbinger of all the wealth to come. Were he less common, he would no doubt be thought by all a kingly bird, the pride of the whole thrush family. Let him hide in distant forests and reveal himself to a lucky few only, and there would be no bird that could excel his beauty, dignity, or song. Unfortunately for his reputation, but happily for mankind, he is one of our most abundant birds and is most content about our dooryards. He and Chanticleer announce the day. *Cheer up, cheer up, cheerily, cheerily, cheerily*, he sings; and one wakes with a smile. How much easier to start the day right when this is our morning summons!

The male robins come first in the spring and await the arrival of their mates. Frequently they do not sing for many days, or even weeks, after arriving, but when the females come in late March or early April they commence their morning and evening choruses. Unlike many brightly colored birds, the males and the females are frequently alike in coloration, the duller colors of some being due more to youth than to sex.

After mating takes place, both birds join in building the nest, which is placed in a crotch on a horizontal limb or on some projecting ledge about our dwellings. Frequently the site is retained year after year. The nest is a rather bulky structure, but a marvel of symmetry in the plasterer's art. An outer layer of straw, rags, and paper is neatly hollowed and filled with wet mud. Bill, feet, and breast are used until a perfect bowl is formed. This is lined with finer grasses until the home is complete. Three to five blue eggs are laid, which both birds take turns in incubating.

Like the young of all our song birds, the robins when first hatched are naked and blind and it is two weeks before they are fully feathered and able to leave the nest. At this time

they differ somewhat in color from their parents, for their breasts are much paler and are covered with large, round, dark spots. In this plumage they are more like other thrushes and show their family characteristics much more plainly than when fully grown.

After the young are able to care for themselves, the parent birds usually start a second brood. It is now that they begin to gain a rather unfortunate reputation because of their fondness for fruit. It has been found, however, that by planting mulberries or some of the native fruits it is often possible to attract the robins from cultivated cherries and berries, and thus protect the fruit in a way that is more satisfactory than by killing the birds. It is doubtless true, however, that in some fruit districts where the natural food supply has been replaced by the much more dependable cultivated fruits, the robins have increased unduly and now do considerable damage; but killing should never be resorted to until competent scientific investigation has been made.

THE BALD EAGLE

From THE CORNELL RURAL SCHOOL LEAFLET

"Bird of the broad and sweeping wing,
Thy home is high in heaven,
Where wide the storms their banners fling,
And the tempest clouds are driven."

—From *To the Eagle*,
By JAMES G. PERCIVAL.

The bald eagle belongs to the order of Birds of Prey, and to the family of Hawks, Eagles, and Kites. Its scientific name is *Haliaeetus leucocephalus*. It is resident throughout (that is, it does not migrate to or from) North America from Mexico to the northern limit of tree-growth.

IT is not uncommon to see this noble bird, the bald eagle, about the Great Lakes, the mountains, and the larger rivers of North America from near the tree limit south to northern Mexico, but its numbers have been considerably



From a photograph by R. J. H. DeLoach.

JOHN BURROUGHS FEEDING A ROBIN ON ANGLE WORMS

In the study of Mr. DeLoach at Athens, Ga. "This robin was picked up about starved to death, but in less than a day

thinned by hunters and egg collectors in spite of protecting laws.

The bald eagle was the largest native bird known to our forefathers and therefore was chosen for our national emblem. Some have objected to it on the ground that it is a scavenger, but in point of fierceness and elegance of plumage it is the finest bird we have. The adults have the head, the neck, and the tail snowy white, and the rest of the plumage brownish black. On account of the white head and tail, adult bald eagles can be recognized a long way off, but the immature birds, which do not have their full plumage for three or four years, are rather difficult to distinguish, for they are brownish black with only a few whitish spots on the under parts and the tail, depending on their age.

Eagles frequent lakes and rivers mostly, for fish is their favorite food, but often, when fish is scarce, they descend to such offal as dead animals in the field, or they may rob the fish hawk (osprey) of his booty. Sometimes, especially in winter, they take dead and wounded ducks on the lakes and the rivers, but they have difficulty in capturing the diving species, such as scaups and canvas-backs.

In New York State eagles nest very early in the spring, in February or early March. In Florida the eggs are laid in December, but in Alaska they are not laid until April. A lofty tree in a lonely woods or swamp is usually the site selected. The nest is placed near the top of the tree, and is a bulky conspicuous structure made of coarse sticks. Two or three dull white eggs without spots or marks of any kind are laid. They are larger than the eggs of a domestic duck, measuring nearly three inches in length. Like the young of hawks and owls, eagles when first hatched are covered with whitish down. It requires four weeks for the eggs to hatch and about four months for the young to acquire their brown feathers and to be able to fly. If the birds are not killed the same eyrie is often occupied for a great many years in succession; each year it is repaired by the addition of a new layer of sticks, twigs, pine-needles, and sometimes of moss.

THE BLUEBIRD

From THE CORNELL RURAL SCHOOL LEAFLET

"Hark! 'Tis the bluebird's venturous strain
High on the old fringed elm at the gate—
New England's poet laureate
Telling us Spring has come again!"

—From *Spring in New England*,
By THOMAS BAILEY ALDRICH.

The bluebird belongs to the order of Perching Birds, and to the family of Thrushes. Its scientific name is *Sialia sialis*. It is found in temperate eastern North America, west to the base of the Rocky Mountains and Arizona and south to the highlands of Guatemala. In this area it has two geographical varieties: the eastern bluebird (*Sialia sialis sialis*) which is the subject of the following sketch, and which is found in eastern North America from Florida and the Gulf States north to southern Manitoba, northern Ontario, southern Quebec, and Newfoundland; and the azure bluebird (*Sialia sialis fulvia*), which is found in southern Arizona and Mexico, and which has the red of the under parts paler and the blue of the upper parts more green than in the eastern bluebird.

THE first robin has been seen in the orchard, scolding at the drifts that cling so long to the fence rows. An early peeper chirps from the pond by the roadside, and the whole landscape steams beneath the bright March sun. A gentle breeze brings us news from the southland and gives us the first fresh odor of spring. Then out of the clear heavens comes the call of the bluebird, gentle and soft and full of gladness, breathing of life and happiness and joy to come. What a wealth of feeling comes with those first mellow notes, what friendliness, what good fellowship toward all nature. The robin scolds at the surly snowdrifts, he sulks whenever the weather turns cold; but not so the bluebird. The March winds with their snows and ice hold no terrors for him, his merry call is never without optimism.

The bluebird is so well known that it hardly needs a description. In size it is between the sparrow and the robin.

The male is much more brilliant than the female, bright blue above and reddish brown below, except for the abdomen which is white. The bird does not appear blue, however, unless the light falls just right, and undoubtedly because of this many are passed without being recognized. Its shape, though, is unmistakable to the experienced eye, appearing as if somewhat round-shouldered. The male bird, moreover, has the habit of fluttering one wing when alighting. These characteristics, together with its cheery call, should always identify it.

The bluebird usually arrives in his northern home a little while after the robin—sometimes the very next day, sometimes a week or more later. When he is late, it is usually a sign of more cold weather, for the bluebird is a better weather prophet than the robin, and is not so often overtaken by the late snows.

Now is the time to have the nesting box ready to coax the bluebird from orchard or roadside to a more intimate place beneath the window or on a post in the yard. The bluebird delights in a nesting box, almost preferring it to a hollow limb in the orchard; and now that the modern orchard has so few dead limbs and knot holes, we should feel it our duty to build the nesting boxes. Almost any sort of box may be selected by a pair of bluebirds for their home, but the one that looks most like the old hollow limb in the orchard will prove most attractive. The entrance hole should be made on one side near the top, and should be about an inch and a half in diameter. No nesting material should be placed in the box, unless perhaps a little sawdust in order to make it seem more like a real cavity. When the bluebirds have once found the box they may return to it year after year. *

The bluebird builds a well-formed nest of rootlets and grasses, and three to five pale blue eggs are laid in it. Both birds take turns sitting on the eggs, which hatch in less than two weeks. The young remain in the nest about two weeks longer; and for some time after they have left the nest they are fed in the trees by their parents. Before they are able to shift for themselves, however, the parent birds begin a second nest. Occasionally they pull out the first nest and build the

second in the same box, but oftener they move to another site; so that it is always well to provide more than one box.

The young bluebirds when they leave the nest do not resemble either of their parents, for their backs are marked with whitish and their breasts have dark spots. In the latter respect they show their relationship to the true thrushes, all of which in some plumage have spotted breasts.

In the late summer and fall the bluebirds gather in scattered flocks, frequently associating with chipping sparrows, and are found all through the open farming country. Their call at this season, *tur-rec, tur-rec*, while quite as friendly as the note of spring, has just a tinge of sadness, and seems as much a part of the fall months as are the calls of the katydid or the rustle of the dead leaves.

THE SCREECH OWL

By WILLIAM DUTCHER

Mourn not for the owl, nor his gloomy plight;
The owl hath his share of good;
If a prisoner he be in the broad daylight,
He is lord in the dark greenwood!

—FROM *The Owl*

By BRYAN WALLER PROCTER.

The screech owl belongs to the order of Birds of Prey, and the family of Horned Owls. The scientific name of the common eastern form is *Otus asio asio*. In its various climatic forms (nine subspecies) the screech owl occurs over much of temperate North America, extending from southern British Columbia to northern Mexico.

WHEN studying the screech owl, the student must always bear in mind its two phases of color—red and gray. A bird of one color may be mated with a bird of another color, either red or gray, or the parents may be of one color and the young of mixed colors; hence this is often called mottled owl. However, no matter what the phase of color is, no person can mistake a screech owl for any other species. The only other owl that might possibly be confounded with it is the saw-whet, which lacks ear-tufts, is brown, and does not have black wing-shafts.

In the eastern States screech owls are very fond of living in apple-orchards, especially where the trees have been neglected and are decaying, thus furnishing the holes in which the birds may breed or hide. The man who is so fortunate as to have screech owls attach themselves to his orchard should consider himself especially favored, for the good that they will do him by keeping in subjection pestilent mice is beyond calculation.

It is probably a fact that screech owls remain mated during life, and, as they are non-migratory, if once they become attached to a locality, they are likely to remain there, unless they are harassed and driven away, or their home is destroyed, and even then they do not move a great distance. For this reason they are doubly of value to the agriculturist, as they help them during the entire year. Their prey, the mice, are yearly tenants, and the farmer who is wise will give the screech owl on his acres a perpetual lease.

Another feature in the life-history of the screech owl, and one that makes this bird particularly valuable, is that it hunts for food at night when most other birds are at rest. It thus supplements the day-work of the rodent-eating hawks, providing a continuous check on the four-footed vermin of the ground. While the screech owls are nocturnal by choice, yet they have no difficulty in seeing in the daytime, although then they are not alert and wide awake, as they are after sun-down, nor are their voices heard.

During the daytime they hide in holes in trees, or in some secluded place in the foliage, to escape observation. Should they be discovered they are likely to be mobbed by other birds, especially blue jays.

Owls are supposed by many superstitious people to be birds of bad omens; this probably arises in the case of the screech owl from its weird, tremulous, shivering, wailing, yet melodious note, which has given it the name shivering owl in some places. To me there is a singular and fascinating attraction in its notes, which are heard in the dusk of early nightfall, and especially when its shadowy form is noiselessly flitting by like a huge, night-flying moth, to be seen only as it crosses a

background of fading western light—a ghostly suggestion of night and solitude.

While the life-history of the screech owl is interesting, yet its economic status is the important fact which needs wide publicity. All scientific students of the food-habits of this species of owl join in pronouncing it to be one of the most beneficial and least harmful of birds. In addition to the great number of rodents it destroys, it eats enormous quantities of noxious insects.

The home of a family of screech owls may often be discovered by the pellets of indigestible parts of the food (bones, feathers, and the like) disgorged after each meal. Such deposits have often been examined, and they yield the same sort of testimony of the utility of the bird as a mouser and insect-eater as do the contents of the stomachs.

THE DOWNY WOODPECKER

From THE CORNELL RURAL SCHOOL LEAFLET

Downy came and dwelt with me
Taught me hermit lore;
Drilled his cell in oaken tree
Near my cabin door.

Architect of his own home
In the forest dim,
Carving its inverted dome
In a dozy limb.

Carved it deep and shaped it true
With his little bill;
Took no thought about the view
Whether dale or hill.

—From *The Downy Woodpecker*,
By JOHN BURROUGHS.

The downy woodpecker belongs to the order of Woodpeckers, and the family of Woodpeckers. Its scientific name is *Dryobates pubescens*. It is resident in all the wooded parts of the United States and Canada.

WE need only to watch intelligently this little black and white woodpecker for two or three days, to learn to call him friend; and thus, wherever he has lived he has earned the name of Friend Downy. He finds the codling moth

hibernating on our apple trees; he goes directly to the wood-boring beetles and their larvæ in our forest trees; and, best of all, he delights to destroy the round-headed apple-tree borers, which are very destructive to our fruit trees. Mr. Vernon Bailey, who took the pains to watch one woodpecker for a forenoon just to see what he would do, tells us that this indefatigable little bird climbed over and inspected 181 woodland trees between 9.40 A.M. and 12.15 P.M., and made 26 excavations for food. Most of these holes exposed galleries in the trunks or in the high branches, where wood-boring ants were hiding. Another downy was seen taking the larvæ of boring beetles from beneath the bark of oak trees. The bird seemed to know the exact spot at which to drill for each larva, for he always cut a small hole directly over the insect. Moreover, this little bird is so friendly that he is willing to come and work on our orchard and shade trees if we only make him welcome. He likes best of all a bit of suet tied to the limb or tacked to the trunk of a tree, and seems to take that as a sign of our good will. Our downies have so much confidence in us that they come to the window sill for their suet banquet, and refuse to be disturbed when we stand within a yard of them.

The downy woodpecker has an attractive black and white uniform. The front of the head is black and there is a black streak extending backward from the eye, with a white streak above and another below it. A broad stripe of white runs down the center of the back. The wings are black with many white spots. The middle tail feathers are black, the outer ones white, barred with black. The male has a vivid red patch on the back of the head; but his wife shows no such frivolity in her dress, and is content with plain black and white.

When searching for food, the downy woodpecker alights low down on the tree trunk and climbs upward in a jerky fashion. It never runs about over the tree, nor does it turn around and go down head first, like the nuthatch. If he wishes to go down a short distance, it accomplishes this by a few awkward, backward hops; and when it really wishes to descend, it flies off and down. Like the other woodpeckers, the downy has a special adaptation to enable it to climb trees in its own man-

ner. In order to grasp the bark on the side of a tree more firmly, its fourth toe is turned backward so that it works as companion with the thumb. Thus it is able to clutch the bark as with a pair of nippers, two claws in front and two behind. The tail is also used as a help in ascending the tree. It is rounded in shape and the middle feathers have rather strong quills, and the ends of the tail feathers are provided with a vast number of bristly barbs which, when applied to the side of the tree, act like a wire brush with all the wires pushing downward. This explains why the woodpecker cannot go backward without lifting the tail.

If Friend Downy has an efficient mechanism for climbing trees, it has a still more wonderful mechanism for procuring its food. When through its acute sense of hearing it detects a grub in the wood of the tree, it seizes the bark firmly with its feet, uses its tail as a brace, thrusts its head and upper part of the body as far back as possible, and then drives a powerful blow with its strong beak. The beak is especially adapted for this purpose, since it is wedge-shaped at the tip, and is used sometimes like a pick. With it a small hole may be drilled directly to the burrow of the grub. When finally the grub is reached, it would seem impossible to pull it through a hole too small and deep to admit of the beak's being used as pincers. But the downy has a tongue just fitted to pull the grub through that little hole. The tip of the tongue is hard and horny, and is covered with short, backward-slanting hooks, which cause it to act like a spear or harpoon when thrust into the grub. The tongue may be extended far beyond the point of the beak, as the bones that support it have a very wonderful arrangement, something like a steel spring.

The downies stay with us all winter because they find plenty of food in trees and do not need to go away, as do the birds that live on insects in their summer stages. This is one reason why the downy is especially valuable; it works for us during the whole of the year.

When spring comes, the red-capped downy thinks about marriage and housekeeping. He is a very limited vocalist, and his sharp call could hardly be made into a love song. There:

fore, our downy turns drummer. John Burroughs describes the drumming of the woodpecker thus: "A few seasons ago a downy woodpecker, probably the individual one who is now my winter neighbor, began to drum early in March in a partly decayed apple-tree that stands in the edge of a narrow strip of woodland near me. When the morning was still and mild I would often hear him through my window before I was up, or by half-past six o'clock, and he would keep it up pretty briskly till nine or ten o'clock, in this respect resembling the grouse, which do most of their drumming in the forenoon. His drum was the stub of a dry limb about the size of one's wrist. The heart was decayed and gone, but the outer shell was hard and resonant. The bird would keep his position there for an hour at a time. Between his drummings he would preen his plumage and listen as if for the response of the female, or for the drum of some rival. How swift his head would go when he was delivering his blows upon the limb! His beak wore the surface perceptibly. When he wished to change the key, which was quite often, he would shift his position an inch or two to a knot which gave out a higher, shriller note."

The downy builds its nest in a hole, usually in a partly decayed tree. An old apple tree is the favorite site. It makes a fresh excavation each year. It lays four to six white eggs on a bed of fine chips at the bottom of the nest. The door to the nest is a perfect circle, about one and one quarter inch across.

THE CROW

By T. GILBERT PEARSON

"A crow has no real pretensions to religion, in spite of his gravity of mien; he is certainly a thief, and probably an infidel.

—NATHANIEL HAWTHORNE.

The crow belongs to the order of Perching Birds and to the family of Crows, Jays, and Ravens. Its scientific name is *Corvus brachyrhynchos*. Its range in summer covers the whole continent northward to Newfoundland and central Quebec in the east, and southern Mackenzie in the northwest; in winter it remains throughout the United States and southern Ontario. Two smaller forms of the crow are found in the United States—one in the southern part of the peninsula of Florida, called the Florida crow, and the other, which is known as the western crow, is found along the Pacific coast and in the Rocky Mountains.

WITH the approach of winter, the country loses its charm for many persons. The green of the fields and the riotous verdure of the woods are gone, and the brown expanses of dead grass and weeds are relieved only by the naked blackness of the forest trees. This, however, is a splendid time to go a-field to look for birds. If the wild life is less abundant now, even more sparse is the human life, and so you will have the country more to yourself.

One of the birds very sure to be seen and heard in a walk is the crow, for many of his race spurn the popular bird-movement southward in the autumn when the north begins to freeze. I like him best at this time of the year. There is no young corn for him to pull now, no birds' nests to pilfer, and no young chickens to steal. He has few places where he can hide, and his black shape looms sharp against the snow-clad hills. I see him sometimes in January as we come down the Hudson together—I in a pullman and he on an ice-floe.

Now and then I see him strike into the water with his beak, or fly a short distance to a rock or exposed gravel-bar, where things that die and float in the river become stranded.

Once I surprised him in the woods, where he had attacked an old, rotten pine-stump. He had torn half of it to pieces and the fragments lay scattered on the snow. Perhaps he was seeking certain insects taking their long winter sleep, or he may have been after beetles. To fathom the mind of a crow takes not only persistent effort but considerable imagination.

At this season crows are highly gregarious creatures; especially at night, when they sometimes collect by hundreds or thousands in some favorite grove. Some years ago there was such a roost near the town of Greensboro, North Carolina. It was resorted to for several years in succession, and was a source of no end of wonder to the people of the surrounding country. The roost occupied several acres in a grove of second-growth, yellow-pine trees. By four o'clock in the afternoon the birds would begin to arrive, and from then until dark thousands would come from all directions. Singly, by twos and threes, in companies of ten, twenty, or a hundred, they would appear, flying high over the forest trees, driving straight across the country, pointing their line of flight as direct as only a crow can fly to their nightly rendezvous. Early in the morning they were astir, and if the day was bright it would not be long until all had departed, winging their way over the fields and woodlands to widely scattered feeding-grounds.

Often I watched them come and go, and one night walked beneath the sleeping hosts and shouted aloud to them; but they did not heed my presence, nor was I ever able to arrive at any reasonable explanation for their nightly assemblies. Surely they did not gather thus, as some writers have suggested, purely because of an impulse for sociability and for love of their kind, for I saw them quarreling among themselves on many occasions.

Especially do I recall one evening when, as I watched them coming to roost, I became conscious of an unusual commotion among a flock of eight. One evidently was in great disfavor with the others, for, with angry and excited cawings, they were striking at him in a most unfriendly manner. The strength of the persecuted bird was all but spent when I first

sighted them, and when, perhaps two minutes later, the fleeing one sustained a particularly vicious onslaught, it began to fall. It did not descend gradually, like a bird injured while on the wing, but plunged downward like a falling rock a hundred feet or more into the top of a large pine-tree, and, bounding from limb to limb, struck the ground but a few yards from me. When I picked it up I found it to be quite dead.

When the pursuers saw their victim fall their caws abruptly ceased, as if the birds were shocked at what they had done; and, turning, they departed silently and swiftly, all in different directions. I wonder if they were executioners performing a duty for the good of the clan? Perhaps they were only thugs, sandbagging a quiet and respectable citizen on his way home!

Birds are particularly subject to disease in winter, and many perish from affections of the throat and lungs. Crows are attacked at times by a malady called roup, and hundreds of the bodies of those that have died from it may sometimes be found on the ground beneath a roost. Wild birds have no doctor who can come at the first signs of an epidemic and vaccinate them against its ravages.

Crows are among the earliest birds in spring to build their nests, and usually freshly laid eggs may be found during the first half of April. These eggs are bluish green, thickly marked with various shades of brown, so that they blend admirably with the canopy of green pine-needles among which the nest is so often placed. To climb to a crow's nest is often quite an undertaking. Sometimes, it is true, the situation may be only thirty or forty feet from the ground, but I recall once climbing to a crow's nest in Florida, which, by actual measurement with a cord, was ninety-one feet in the air. The nests are heavy, compact structures, made of sticks and twigs, and lined with grapevine-bark, grass, and sometimes with moss. The old birds are usually very quiet when in the immediate neighborhood of their nest, and frequently the only evidence one will have of the fact that they are near him is seeing a crow fly swiftly and noiselessly away among the tree-tops.

For hundreds of years farmers have regarded the crow as one of their most annoying enemies. This is chiefly because the crows dearly love to pull up corn shortly after it has sprouted. They do this to get the grain of seed-corn, which has become softened by contact with the soft earth. Then, too, as the grain begins to germinate, the starch it contains turns to sugar, and thus there is made a dainty tidbit which is quite to the liking of a hungry crow. Very naturally, therefore, the farmer seeks to rid the neighborhood of these black-feathered visitors. Time and again he takes his gun and sallies forth; but no sooner does he enter the field where the birds are feeding than an old crow, which has established himself as a sentinel on some tree or fence-stake, gives a warning "*caw*" that all of his friends understand, and in a moment the entire flock takes flight to the nearest woods, where they calmly await the departure of their disturber.

Now and then the farmer or his boy, by hiding among the trees or along a fence, succeeds in shooting a crow. When this is accomplished, the bird's body is often tied to a pole, which is then set up in the field as a warning to the bird's fellows of the fate that awaits them if they persist in returning. A chorus of jeering *caws* is often the only answer the farmer gets for his trouble, for let no one ever forget that the crow is about the smartest bird of which we have any knowledge. If he were not a bird of most unusual wisdom, his race would long since have passed away. Think of the hundreds of thousands of farmers who, through the centuries, have tried every possible means of destroying these birds! No law in any State protects them, and many times bounties have been paid for their heads, thus offering a special inducement to men to kill them. Guns, traps, poison, and destruction of their nests have all alike been in vain, for the crows live on in apparently undiminished numbers.

As a matter of fact, the crow is not altogether a bad bird, and if he were understood better I have little doubt that he would have far more friends than foes. He eats a great many harmful insects, and in this way makes amends for his sins in the cornfield. May-beetles, June-bugs, and other insects of

a similar character, are eaten by crows in great numbers during the spring and early summer. Some observers state that baby crows are fed to a very large extent on this kind of diet. Crows like grasshoppers, especially in the spring, and annually consume large quantities of them. They eat also, among other objects, such queer foods as frogs, toads, and young turtles, and even small snakes find favor in their eyes. The wild fruit they take is mostly such as that of the dogwood and the sour gum. Sumac-berries of different kinds are eaten. In fact, the crow will sample almost anything that looks as if it might be good to consume, such as frozen apples, pumpkins, turnips, potatoes, or any other fruit or vegetable that may be discarded and left to lie in the orchard or field. In cold, snowy weather, food sometimes becomes very scarce. On such occasions crows will feast on any dead animal to be found, such as a horse or a cat. They sometimes go down to the shore and hunt for clams, crawfish, and the bodies of dead fish that have washed ashore. This practice, however, may more often be observed in the fish crow, a bird slightly smaller than our common crow, and found chiefly along the sea-coast, and about the larger lakes and water-courses.

The crow, in its various forms, has a wide distribution throughout North America; and there is hardly a boy or girl who does not know its cry, or who is not familiar with the sight of the big, black fellow flying over the fields or resting for a moment on the top of a tree by the roadside. It is undoubtedly the most common and most generally known bird in the United States.

THE RUBY-THROATED HUMMING- BIRD

"On the hummingbird flames the sunlight,
On his breast the rainbow dwells."

—From *Colors of Birds*,
By GUSTAVUS FRANKENSTEIN.

The ruby-throated hummingbird belongs to the order of Long-banded Birds, and to the family of Hummingbirds. Its scientific name is *Archilochus colubris*. In the spring and summer it is found in eastern and central North America from southeastern Saskatchewan, central Quebec, and Cape Breton Island south to the Gulf coast and Florida and west to North Dakota, Nebraska, Kansas, and central Texas. In the winter it is found from middle and southern Florida and Louisiana through southern Mexico and Central America to Panama.

A CHARMING (and accurate) description of hummingbirds is given by Robert Ridgway in his *Birds of North and Middle America*. "Diminutiveness of size and metallic brilliancy of coloring are the chief external characteristics of hummingbirds, though exceptions to both occur; and in these respects they, as a group, have no rivals. Unfortunately stuffed specimens convey but a faint idea of their splendid coloring, for the perfection of their changeable refulgence can be fully realized only in the living bird, whose every change of position flashes to view a different hue—emerald green replacing ruby red, sapphire blue succeeding fiery orange, or either becoming opaque velvety black—according to the angle at which the sun's rays touch the feathers, an effect which can only partially be imitated with the stuffed specimen by artificially changing its position with reference to the light. Many species have a spot of the most luminous or brilliantly metallic color (usually green) that it is possible to imagine on the forehead at the base of the bill, this spot being surrounded by the most intense velvety black—evidently to enhance the brilliancy of the ornament by contrast, just as a jeweler would,

for the same purpose, display a diamond or other gem against a background of black velvet. Often there is a spot of brilliant color and one of a contrasting hue just below it, the result being that first one color, then the other, is flashed forth as the bird changes slightly its position."

More like a bumblebee or a butterfly than a bird, the tiny hummer darts from flower to flower probing the nectary for honey with its long, slender bill.

Hummingbirds are found in North and South America and nowhere else in the world. In the United States seventeen different kinds have been seen; these were all in the western and southwestern part. Only one of these species, the ruby-throated, is found in any of the eastern States. It is only about three and a half inches long, but what it lacks in size it makes up in brilliancy of color.

The nest of the hummingbird is often placed in the orchard, saddled on a slender branch. It is made of various cottony substances bound together with spider webs, and the whole is completely covered with lichens, which give it the appearance of a green and gray knot and make it very difficult to find. The female always lays two tiny white eggs scarcely larger than beans. When the young birds first hatch, they resemble the young of other birds, but as they grow, their bills become very long like those of their parents. This is an adaptation for extracting the nectar from such flowers as the honeysuckle and the trumpet creeper. Hummingbirds eat also small flies, and the insects that live in flowers. The young hummingbird is fed by regurgitation, the bill of the parent being inserted far down the throat of the young and nectar and small insects being automatically injected into its stomach.

The hummingbirds begin to leave their summer homes in early September for southern Florida, Mexico, and Panama, and do not return to the northern States until May.



TROPICAL AMERICAN HUMMING-BIRDS

THE ENGLISH SPARROW

From THE CORNELL RURAL SCHOOL LEAFLET

The English Sparrow belongs to the order of Perching Birds, and to the family of Finches. Its scientific name is *Passer domesticus*. It is a native of Europe where it is found in all countries except Italy. It has been introduced into the United States, where it is thoroughly naturalized in all settled districts except southern Florida and a few other extreme outposts. It has been also introduced into the Bahamas, Cuba, Nova Scotia, the Bermudas, and southern Greenland.

THE introduction of the English sparrow into America is one of the strongest arguments for nature study. Ignorance of principles that any child trained in nature study should know, in this instance alone, costs the United States millions of dollars every year.

The English sparrow is the European house sparrow. It was thought to be an insect eater, but no one took pains to verify the surmise. About 1850, some persons with praiseworthy zeal but with lamentable folly, introduced this sparrow into New York, and during the twenty years following other importations were made. In twenty years more, people discovered that they had taken great pains to establish in America one of the worst nuisances in all Europe. In addition to the direct damage done by the English sparrow, it is so quarrelsome that it has driven away many of our native beneficial birds. But since this bird is with us, if we can make it of any use, let us hasten to do so. There is no bird that affords a more difficult exercise in describing bird colors than does the English sparrow; and furthermore, if the children of the land study the habits carefully, they may discover a more effective means of discouraging the presence and increase of this noisy, rascally bird neighbor.

It is amazing how few persons can distinguish the sexes of the English sparrow, although the two may be seen in every

flock. In the male sparrow the top of the head is gray, with a patch of reddish brown on either side; the back is brown, streaked with black; the tail is brown; the wings are brown with two white bars and with a patch or stripe of red-brown; the sides of the throat are white; the middle of the throat and the upper breast are black; the lower breast and the under parts are grayish white. In the female sparrow the head is grayish brown; the back is brown, streaked with black and dirty yellow; the throat, breast, and under parts are grayish white and the bird has rather a faded appearance.

Although this sparrow is common, its coloring varies in vividness so much at different times of the year that I have known experienced bird observers to be misled by its appearance, especially by that of the female, and to think for some moments that it belonged to another species.

The chipping sparrow is much more slender and about an inch shorter than the English sparrow, and has the bright red-brown for a crown instead of for wing ornamentation. The song sparrow is only slightly smaller than the English sparrow, but its long tail gives it a much more slender appearance. The song sparrow has no bars on its wings and has a spotted breast with a larger dark spot at the middle, very different from the cravat of the English sparrow. The tail of the English sparrow is short and not notched at the end, and these peculiarities alone will distinguish it from the song sparrow and the chipping sparrow.

The size of the English sparrow is taken often as one of the standards in noting the size of wild birds, and you should train yourself to recognize its size accurately. This may be accomplished by comparing it with all other birds common to the region. The English sparrow measures 6.33 inches in length; the chipping sparrow, 5.37; the song sparrow, 6.30; the robin, 10.00; the bluebird, 7.01; the goldfinch, 5.10.

The English sparrow prefers the cultivated grains to the seeds of wild plants. It takes the seed after sowing, and also attacks the new grain in the sheaf. Wheat, oats, rye, barley, corn, sorghum, and rice are thus attacked. The bird also destroys buds and blossoms of fruit trees and occasionally

injures the ripe fruit. It has the characteristic wide, strong beak of grain-eating and seed-eating birds.

When feeding, the English sparrow is noisy and quarrelsome; if there is no other species of bird for it to attack, the birds will fight among themselves—for this sparrow seems to have a “chip on the shoulder.” When it sings, it gives voice to vexatious chirping; it squalls when frightened; cheeps plaintively when lonesome; and makes a great disturbance when fighting.

But in the matter of cunning we must admit that the English sparrow is the superior of many birds of more pleasing personality. Undoubtedly its achievements are due in large measure to its cleverness. It is very quick to take a hint. I know of several instances in which firing a shotgun into the midst of a flock of these birds drove them all from the premises, although none were killed. I have seen a mother sparrow employ the most skillful tactics in stealing earthworms from a mother robin who was trying to get them for her own family.

The nest of the English sparrow is built in a protected nook beneath eaves or other covering. Often it is placed in vines against a building, and occasionally it is built in trees. It is an untidy affair, made of coarse straws or grass and feathers without fashion or form. In these careless nests the whitish brown or gray flecked eggs are laid and the young reared. I do not know that the number of broods in a season has ever been recorded, but the sparrows begin to nest early in the spring and keep at it industriously until snow comes in the late fall.

In the summer, these sparrows scatter through the country for nesting and for greater food supply. In the winter they flock to cities and villages, living on the seeds in the refuse of the streets or in barnyards. It is safe to say that the only welcome these little emigrants get in America is in the larger cities, where no other bird could possibly “make a living.” They will not build their nests in boxes suspended by wire and they do not like a box having no resting-place before the door; this latter preference may keep them from taking the quarters meant for bluebirds. If the opening to the nest is

an inch in diameter, it will admit wrens and chickadees but will exclude the sparrows.

THE SONG SPARROW

By T. GILBERT PEARSON

"Sunshine set to music!
Hear the sparrow sing!
In his note is freshness
Of the newborn Spring."

—From *The Song Sparrow*,
By LUCY LARCOM.

The song sparrow belongs to the order of Perching Birds, and the family of Finches. Its scientific name is *Melospiza melodia*, applied properly only to the typical subspecies found everywhere east of the Rocky Mountains. The song sparrows of the Pacific Slope have been modified by climatic differences into many local races. It is migratory, as a species, only in the northern half of its range.

ONE July morning, while walking through a grove on the shores of Lake Champlain, my attention was arrested by the loud and repeated cries of a bird evidently begging for food. A hundred feet away I found the distressed creature standing on a flat rock, and repeatedly voicing his complaint with scarcely a pause. It was a dark brownish bird, and its color and form indicated that it belonged to the blackbird family. For perhaps three minutes I watched it, and then suddenly a little bird darted through the bushes, in appearance totally unlike the one before me. It went straight to the rock, and, alighting, proceeded at once to feed the big, hungry baby. I had discovered a young cowbird being fed by a song sparrow. While the occurrence was not particularly unusual, such a scene, nevertheless, is likely to attract the close attention of an observer, so I stopped for a time to watch the scene. It always seems so odd to see a dainty little sparrow ministering to the wants of one of these parasites of the bird-world.

A few weeks before, while the song sparrow was away from its nest, a roving cowbird had slipped in and deposited

her egg with those of the rightful owner of the nest. Then, unnatural mother that she was, she went her way and abandoned her treasure to the care of the song sparrow, which, while sitting on her own eggs also brooded tenderly over that of the cowbird, and, in due time, brought forth the young one into the world.

Afterward, from time to time, I watched as best I could the movements of this little sparrow-mother. Although she was seen frequently for several days feeding the great cowbird's youngling that had been foisted on her, not once was she detected feeding a baby of her own. What had become of the young song sparrows, which must have been hatched in the nest at the same time when the young cowbird appeared? No one knew; but it is quite probable that they were crowded out of the nest by their great, unwelcome bedfellow, long before they were able to fly. So, down on the ground under the nest, they doubtless lay in baby helplessness, in the cold and the rain, while hunger gnawed at their lives, and death slowly drew its veil across their little eyes.

A week later another song sparrow was found feeding one of her own young, and also two cowbirds. All over those regions of North America where both the song sparrow and the cowbird are found in summer, these unnatural happenings are taking place. It is indeed fortunate that cowbirds' eggs are not deposited in the nest of every song sparrow, else we might lose, in a few years, the presence of this, the most charming of all our native sparrows. How fortunate it would be if some one understanding the language of the birds would go through the woods each spring and whisper to every song sparrow, "Beware the cowbird's spotted egg; throw it out of your nest!"

Hunting the song sparrow's nest is an interesting experience. The most effective way to find one is to watch the birds during the months of May and June when they are engaged in nest-building. When you discover one holding dry grass-blades or fragments of dead leaves in its bill, drop everything else you may have in mind and keep your eyes on it. If the bird sees that it is observed it may become suspicious,

and alight on various perches before going to the spot where the new nest may already be taking shape. It is well, therefore, to remain as quiet as possible, making no unnecessary noises, and, above all, no sudden motions.

After the eggs are hatched, the nest is even more easily found by watching the birds, for then one or the other of the parents ordinarily visit the nest every few minutes, as the young are great eaters and their appetites seem never satisfied. In examining an occupied nest the greatest care should always be taken. It is not well actually to touch a nest nor disturb much the leaves or grass that usually covers its hidden retreat. When the young have left it, however, there is no reason why the nest should not be taken if one wishes to do so, for neither the old birds nor the young will return to it.

Inspection will show it to be made of such articles as coarse grasses, small roots, dead leaves, and strips of bark, the lining, where the bodies of the little ones have rested, is usually composed of fine grasses, and sometimes long hairs are used. The nest seems to be so simple a structure that one might almost believe he could himself make a song sparrow's nest; but try it and see how you prosper! Take the materials of the nest you have just pulled to pieces and try to reconstruct it properly. I have a nice present for the boy or girl who can do so successfully.

The nests are very often found to be on the ground in a meadow or wood-lot; frequently they are hidden in bushes. Sometimes they are far from a building of any kind, and, again, they may be very near human habitation. At a summer resort in the mountains of North Carolina I once found that a pair of song sparrows had built their nest in a little cavity on the edge of a small terrace, directly in front of a hotel veranda, where a hundred guests came and went continually.

The song sparrow's eggs number four or five, and are usually bluish-white, with many brown markings distributed thickly over the surface.

"Last season," writes John Burroughs, "the whole summer through, one sang about my grounds like this: *Swee-c-t, swee-c-t, sweet, bitter*. Day after day, from May to Septem-

ber, I heard this strain, which I thought a simple but very profound summing-up of life, and wondered where the little bird had learned it so quickly."

These birds, in common with most other small species of our feathered neighbors, are very fond of insects and their larvæ, and in the spring and summer song sparrows are of great service to mankind by destroying these pests of the garden. They eat berries and small fruit, but to a limited extent only, wild varieties usually being chosen. After the insects have gone, or even before that time, these sparrows become very busy eating grass and weed-seeds, and in the south, where they spend the winter months, seeds make the principal part of their diet.

THE ROAD-RUNNER

By WILLIAM L. FINLEY

The road-runner belongs to the order of Cuckoos, Trogons, and Kingfishers, and to the family of Cuckoos. Its scientific name is *Geococcyx californianus*. It is found in California, Colorado, Kansas, and western and middle Texas, south through Lower California and the tableland of Mexico to Pueblo.

THE road-runner is one of the most striking characters of the cactus belt of the Southwest. When we first went to Tucson, Arizona, we were anxious to find a road-runner. Day after day we searched through the cactus, and kept our eyes open. We found several old nests, and occasionally we would catch a glimpse of a slim, long-tailed bird running through the cactus. One day when we least expected it, a road runner slid across the road, hopped up into a cholla cactus, and was instantly lost to sight in the thorny mass. We drove around the bush slowly, once, twice, closer and closer, till we could see through the tangle. But no road-runner! She had disappeared, and yet she could hardly have escaped without our seeing her. A slight movement in the cactus—there she was, sitting bolt upright holding a lizard in

her bill. Until she moved she was as completely hidden as if she had not been there.

In this nest were one fresh egg, one egg just ready to hatch, two featherless, black-skinned young birds, and two young ones about grown and ready to leave home. This certainly verified the statement of Elliott Coues: "Perfectly fresh eggs and newly-hatched young may be found together, and by the time the last young are breaking the shell, the others may be graded up to half the size of the adult."

I have occasionally seen an old road-runner that takes a delight in outdistancing a team of horses, but sometimes a road-runner is not accustomed to our modern method of traveling. One day a friend was spinning down the Oracle Road in his automobile when, at the turn, a road-runner dropped into line ahead and set the pace down the smooth stretch. The driver turned on a little more gasoline. The road-runner looked over his tail at the horseless carriage. It was gaining on him! As the machine bore down on the astonished bird, the feathered racer was scared. He cocked his tail suddenly to put on the brake, made a sharp turn to the left, dodged through the cactus and creosote and away he went at top speed as far as he could be seen.

While some people accuse the road-runner of killing other birds, especially young quail, our experience showed that he lived almost entirely on lizards. The young birds in the nest were fed on lizards almost from the time they were out of the egg. The reptile was always killed and then thrust head down into the mouth of the youngster. The tail for a time would hang out of his mouth, but as the head end was digested, the young bird gulped a little now and then, until finally the end of the tail disappeared.

THE JUNCO

From THE CORNELL RURAL SCHOOL LEAFLET

"He sits in Winter's sleet,
And the snow is round his feet,
But he cares not for the cold;
For his little cheerful heart
Thinks the snow as fair a part
As the Summer's green and gold."

The Junco belongs to the order of Perching Birds, and to the family of Finches. Its scientific name is *Junco hyemalis*. It is found in America from the tree limit south to the Gulf Coast and Mexico. It breeds in the more northern parts of its range and in the more elevated parts. In this area are several geographical variations.

BRIGHT light was streaming from all our clubroom windows. Within everything was cheerful, but without all was dark and cold, for it was already late in October. Suddenly we heard a tapping at the window, and looking up we saw a flutter of wings against the glass. We hastened to open the window, and in flew a little bird.

Just the color of the night he was, without a streak or a spot except for a little apron of white extending from his breast backward. Even his throat and breast were slaty black. When he flew from the window to the bookcase, however, he showed us that his outer tail feathers were as white as his breast. It was a junco. Some persons call him snowbird, but there is another bird which has that name; therefore we shall call this one a junco.

Why had the little junco come to our window, where had he been, and where was he going? I wish he could have spoken, for I am sure he could have told us many interesting adventures. He would probably have told us that winter was coming, and with it heavy snows in the North which would cover up all the weeds and seeds on which he depends for food, and that he was traveling toward the South where the snows are not so deep and where some of the weeds remain above the surface all winter. Like his other brothers he is

afraid to travel during the day, when his enemies, the hawks, are hunting; therefore he flies with many others at night. On clear nights he flies very high, but on this cloudy night he had come close to earth so as to follow the landscape.

The junco could have told us how, in the spring, he had journeyed northward far up into a Canadian wood where he had found a place beneath a tangle of brush to build his nest and rear his family; and how, with the oncoming of cold weather, he had started southward where he knew he could find plenty of food.

If the snows do not become too deep he stays with us all winter, feeding about our doorsteps and along our fence rows. Oftentimes he travels in company with the tree sparrow, and a little careful search will reveal him in almost any weedy spot that is sheltered from the wind. The junco can easily be distinguished by his blackish color, the tree sparrow being brown.

When you find a flock of juncos, watch them as they feed and learn what kind of food they prefer. A single junco destroys more weeds than will any number of boys, because he takes them in the seed; and thus all our young naturalists are saved a great deal of work.

BIRDS' NESTS

By W. J. CLAXTON and OTHERS

I've plucked the berry from the bush, the brown nut from the tree,
But heart of happy little bird ne'er broken was by me.
I saw them in their curious nests, close crouching, slyly peer
With their wild eyes, like glittering beads, to note if harm were near;
I passed them by, and blessed them all; I felt that it was good
To leave unmoved the creatures small whose home was in the wood.

—From *Sing On, Blithe Bird!*

By WILLIAM MOTHERWELL.

THE large birds are invariably clumsy builders. The nests of the large pigeon family are very thin structures, often consisting only of a thin layer of twigs sufficient to form a platform on which to lay the eggs and sit on them.

You have only to cast your eyes around to see the rather solid and heavy nests of the crow, built along the trunks of the tall elms, great boat-shaped structures made with sticks, mud, moss, etc. It requires much labor to gather all these materials and weave them into shape. There is rarely more than one crow's nest on a tree, and this tree invariably stands by itself.

To find the most clumsy architects in bird-land we should want to go no farther than the nests of the English sparrows. They seem to have no idea of quantity, and enough feathers, straw, hay, etc., are used to suffice for a dozen nests. Neither have they any idea of neatness. The whole is stuffed into the gutter or in a hole under the eaves, and frequently a fair amount of material is left hanging outside.

I want you to imagine that you are standing in a huge forest. Someone comes along and says to you, "Here is wood in abundance; underneath is the golden bracken, and over by the pool are the sedges. Take the timber and construct a house; roof it with the bracken and sedges; use no tools in the process; have nothing to help you except the 'tools' with which Nature has provided you—your hands, mouth, and feet."

Surely you would think this a strange order! How are the trees to be cut down? Where are the nails with which to fasten the planks, even if you succeeded in lopping a few branches? How are the foundations to be dug, with nothing except hands to use? Hands and feet, too, will make very poor trowels with which to plaster the ceilings, walls, etc. No! the task is impossible; no man living could make a satisfactory dwelling under such conditions as these!

But what clever man cannot do, our little feathered friends accomplish quite easily. True, they do not cut down trees—such huge things are not required in the construction of their tiny dwellings—but when twigs are wanted they soon find a way to snap or saw them off. For hours and hours they fly hither and thither in search of the materials they require. Maybe some wool is wanted; two or three miles away is a flock of sheep; away they go, returning with huge "bundles" in their mouths.

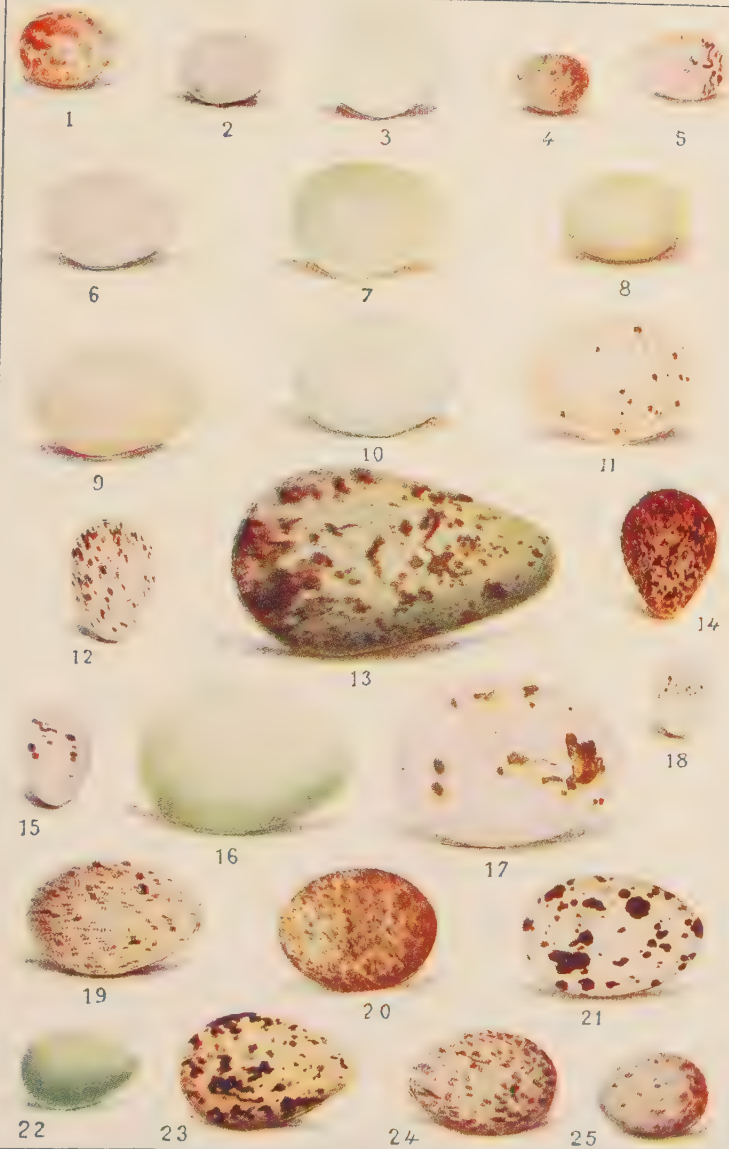
Have you ever thought what a large amount of material a bird can carry in proportion to its size? It is a common sight to see some of the smaller building birds bear a burden almost as large as they are. Imagine that you are carrying a load equal in size to yourself. Even if the material did not weigh a great deal, it would be a very awkward parcel to carry about.

Perhaps some of you may have tried to make a bird's nest. You may have had moss, dry grass, feathers, down, and so on, with which to work. Some years ago I was talking to a number of boys about these wonderful little bird homes, and we tried to make one. We took as our model the nest of the Jenny Wren. Our materials were dried moss, leaves, and lichens, with a few feathers for the inside lining. We noticed that "Jenny's" nest had a side entrance and that the top was dome-shaped. We tried to fasten the moss and leaves on an old tree stump up which the ivy had climbed. What a task we had! Many of the boys lost patience altogether when they tried to interweave the moss, leaves, and feathers. And yet "Jenny's" nest seemed as if the materials were glued together, so smoothly and evenly were they arranged. When we finished our structure it was a far different home from the elaborate and artistic nest which we had tried to copy, and this practical experience more than ever convinced us of the wonderful patience and care that birds must bestow in building their homes.

Strange to say, it is the smaller birds which build the most artistic nests. The clumsy crow and rook, together with the large pigeon family, are very careless and untidy. But with the exception of the sparrow and a few others, we generally find neat little dwellings built by our smaller feathered friends.

The most satisfactory and accurate way of identifying a bird's nest is to find it while still occupied and to identify the builder. Then after the young have flown, the nest can be taken, and will mean much more in the collection than it would if it were not discovered until winter.

A word of caution is necessary here, however. Those who



CHARACTERISTIC FORMS AND MARKINGS OF AMERICAN BIRDS' EGGS

SEA-FOWL:—13. Guillemot. 14. Tern. 21. Skimmer. WATER-FOWL:—9, 16. Ducks, WADERS. 7. Heron. 11. Gallinule. 12. Snowy Plover. 23. Stilt Sandpiper. 24. Ring Plover. GAME-BIRDS:—6. Partridge. 19. Ptarmigan. BIRDS OF PREY:—3. Owl. 17. Buzzard-hawk. 20. Falcon. CUCKOOS:—8. Cuckoo. 10. Roadrunner. SONG-BIRDS:—1. Mockingbird. 2. Towhee Finch. 4. Sparrow. 5. Oriole. 15. Blackbird (grackle). 18. Flycatcher. 22. Robin (Thrush). 25. Woodhouse's Jay.

have found and watched birds' nests often complain that something usually happens to the eggs or the young birds. There are creatures always on the watch for an opportunity to rob birds' nests. The fox sometimes follows a man-track. Perhaps he has learned that the path of a man in the woods often leads to food. Too often the man-trail leads to wounded or dead birds and animals; the remains of a lunch may reward the fox. Sometimes fish-heads and other offal are thrown around the camping-place. So Reynard cunningly follows. Those who closely examine the nests of birds in trees or shrubbery are likely to be watched unawares by the astute and cautious crow, the thieving jay, the mischievous squirrel, or the bloodthirsty weasel.

Edward H. Forbush says: "I have learned by sad experience that a close or frequent examination of a bird's nest in the woods only serves to call the attention of the bird's enemies. I have seen both jay and squirrel following a man through the woods, keeping well hidden from his sight. If you approach a nest containing young, the cries of the parent bird may apprise all the wood folk of its location. Therefore, watch the birds with a glass, and do not go to the nest. Those who carelessly approach the nests of herons or water-birds that breed in colonies are likely to drive the old birds away, and thus expose the eggs and young to the attacks of crows, for crows are quick to seize such opportunities."

When watching a nest, approach it with caution, and observe it from such a distance that neither young nor old will be much disturbed by your presence. Many interesting habits may be seen in this way, if a good glass is used.

HOW TO ATTRACT BIRDS

By WALDO LEE McATEE

THE means of increasing the number of birds about the home are few and simple. They comprise adequate protection and the provision of suitable nesting-places, food, and water.

Protection is the prime requisite for increasing the number of birds in any area, and the results of protection are in direct proportion to its thoroughness. Besides being insured against every form of persecution by human kind, birds must be defended from various natural foes. The most effectual single step is to surround the proposed bird sanctuary with a vermin-proof fence. Such a fence should prevent entrance either by digging or by climbing, but will serve its greatest use if it cannot be climbed, and is therefore cat proof. For this purpose the erect part of the fence above ground should be six feet high, and the weave should not be more than one and one-half-inch mesh. The overhang should be two feet wide, and if strung with wires these should be not more than one and one-half inches apart. If it is impracticable to build an impenetrable fence, the next best device is to put guards of sheet metal on all nesting trees and on poles supporting bird houses. This should be done in any case where squirrels or snakes are likely to intrude, as it is usually impossible to fence out these animals. Tree guards should be six feet or more above ground. Attacks by hawks, owls, crows, jays, or other enemies are best controlled by eliminating the destructive individuals.

Although a considerable number of our native birds build their nests on the ground, the majority place them in trees or shrubs, either in holes or on the limbs or in the crotches. Shrubbery and trees for nesting sites, therefore, are essential for making a place attractive to birds, and a double purpose is served if the kinds planted are chosen from the list of fruit-bearing species given farther on. Shrubs should be allowed to form thickets and should be pruned back severely when young, so as to produce numerous crotches.

Constant removal of old trees and modern tree-surgery have resulted in a great diminution in the number of tree cavities, the natural homes of most of our hole-nesting birds. Fortunately, most of these birds will utilize artificial nest cavities or bird houses. The most common errors in putting out bird houses are choosing poor locations and supplying too many boxes. A bird house needs only partial shade, and

houses on poles usually are taken. Martins prefer a house standing apart from trees. Entrances to boxes should be sheltered by projecting roofs and should face away from the prevailing wind and rain storms. All bird houses should be constructed so that the interior may easily be examined and cleaned.

As a rule, birds do not like being crowded, and if a place is studded with bird houses only a few of them will be occupied. Birds not only do not want bird neighbors too near, but they are impatient of human meddling, and therefore should be granted as much privacy as possible during the actual incubating and brooding. Nests built in shrubbery are especially likely to come to a bad end if the birds are frequently disturbed.

If ground-nesting birds, as bobolinks, meadowlarks, and bob-whites, are to be protected, grass in the nesting fields must not be cut during the breeding season.

Nothing has a more potent attraction for birds during hot weather than drinking and bathing places. The birds' water supply should be a pool not more than a few inches deep, the bottom sloping gradually upward toward the edge. Both bottom and edge should be rough, so as to afford a safe footing. A giant pottery saucer is an excellent device, or the pool may be made of concrete or even metal, if the surface be roughened. The bird bath may be elevated, or on the ground if on an open space where skulking enemies cannot approach too near.

A water supply is appreciated in winter as well as in summer. If running water cannot be provided, that supplied should be warmed to delay freezing.

Food supply is the vital factor in bird life, and the most important single offering that can be made in efforts to attract birds. It is important to note that an ample supply of food prior to and during the nesting season tends to increase the number of eggs laid and also the number of broods in a season. Bird food may be supplied in two ways—by planting trees, shrubs, and herbs which produce seeds or fruits relished

by birds, and by exposing food in artificial devices. The most familiar phase of the latter method is winter feeding.

During the season when the natural food supply is at its lowest ebb, birds respond most readily to our hospitality. Winter feeding has become very popular, and the result has been to bring about better understanding between birds and human kind.

The winter foods commonly used include suet or other fat, pork rinds, bones with shreds of meat, cooked meats, meal worms, cut-up apples, birdseed, buckwheat, crackers, crumbs, cocoanut meat, cracked corn, broken dog biscuits or other bread, hemp seed, millet, nut meats of all kinds (especially peanuts), whole or rolled oats, peppers, popcorn, pumpkin or squash seeds, raw or boiled rice, sunflower seeds, and wheat.

The methods of making these supplies available to birds are as varied as the dietary itself. A device very commonly used is the food tray or shelf. This may be put on a tree or pole, by a window or at some other point about a building, or strung upon a wire or other support on which it may be run back and forth. The last device is useful in accustoming birds to feed nearer and nearer a comfortable observation point. A fault with food shelves is that wind and rain may sweep them clean and snow may cover the food. These defects may be obviated in part by adding a raised ledge about the margin or by placing the shelf in the shelter of a wall or shielding it with evergreen branches on one or more sides. A feeding slab may be fitted into a groove from which it can be removed when it is necessary to replenish the food; the food of seeds is attached to the under side by pouring over it melted suet. In this device a perch, shaped like a letter U, is fastened to the food side of the slab and the birds feed by reaching upward.

Feeding devices not affected by the weather are preferable. An excellent one is a cocoanut with a hole bored in one end. The cavity is filled with chopped suet and nuts or other food mixture, and the nut is suspended by a wire from a limb. The size of the hole regulates the character of the guests; if small, large birds cannot gobble the supply. The cocoanut



SUNFLOWER

The seeds of the sunflower are greatly beloved by the birds, and a few plants of the wild or cultivated species should be placed in every garden

meat as well as the stuffing is eaten. Cans with small openings may be substituted for cocoanuts. Food baskets of any desired size made of wire netting or a metal grating may be hung up or fastened to the trunk of a tree. Food mixtures in melted fat may be poured into holes made in a branch or stick or in cracks of bark or over evergreen branches. All of these devices minimize or obviate the disturbing effect of stormy weather.

Those who desire to have birds about their homes should not feel that their power to attract them is gone when winter is over. Winter feeding easily passes into summer feeding, and experience proves that some birds gladly avail themselves throughout the year of this easy mode of getting a living.

We have thus far considered ways of feeding birds tidbits we ourselves have gleaned. We may feed them by another method, by cultivating their natural food plants and allowing them to reap the harvest in their own way.

Less has been done in this respect for the true seed-eating birds than for those fond of pulpy fruits. The reason is obvious, however. Our seed-eating birds largely patronize weeds, which we do not wish to cultivate, while the fruit-eaters depend upon many plants which we hold in such esteem for their ornamental value that they are generally cultivated.

Something can be done, however, to attract the seed-eaters about our homes. A number of commonly cultivated annual plants, belonging to the same groups as those upon which the birds feed extensively in nature, produce good crops of seeds. These plants, being dependent upon cultivation, can be used without fear that they will become pests. The following are suggested for the purpose: Prince's feather (*Amaranthus cruentus*), love lies bleeding (*A. caudatus*), asters, calandrias, blessed thistle (*Carduus benedictus*), centaureas, California poppies (*Eschscholtzia*), sunflowers, tarweed (*Madia elegans*), forget-me-nots, *Polygonum orientale* and *P. sachalinense*, *portulaca*, *silene*, and sugar cane (sorghum varieties).

The various millets are relished by nearly all seed-eating birds. Common millet (*Panicum miliaceum*), Japanese millet or barnyard grass (*Echinochloa crus-galli*), and German millet

or Hungarian grass (*Sctaria italica*) may be obtained from most seedsmen, and should be planted in abundance by those wishing to attract granivorous birds. The height and stiffness of stalk of varieties of sorghum should make these abundant seeders valuable in winter. Japanese millet holds its seeds well, and, if planted thickly where it can grow up through a horizontal lattice work, makes a valuable cover and feeding place for winter birds. Canary grass (*Phalaris canariensis*) and various species of *Pennisetum* also are good for seed-eating birds.

Alders and birches bear in their numerous cones a supply of seeds which are eagerly sought for by redpolls, siskins, and goldfinches during the winter. Still another group of birds may be catered to by planting ashes and box elders. The winged fruits of these trees are opened and the seeds eaten by pine and evening grosbeaks, the visits of these birds being largely regulated by the supply of this kind of food. Larches, pines, and other conifers are attractive to crossbills as well as to some of the species just mentioned.

Feeding fruit-eating birds is best accomplished by planting selected species of fruit-bearing shrubs and trees. Through late spring and summer there is usually an abundance of insect food in addition to fruit enough for all the birds. So far as fruit alone is concerned, fall is the season of overflowing abundance; in winter the supply gradually decreases, and late winter and early spring are the seasons of actual scarcity. This is the critical time of year for many birds, and a plentiful supply of wild fruit will tide them over. Fortunately, everywhere in the United States there are some fruits that persist until there is no longer any need of them. If enough are planted, no birds able to live on this class of food should starve. The best of these long-persisting fruits are juniper, bayberry, thorn apples and related fruits, holly, and snowberry.

BIRD HOUSES AND HOW TO BUILD THEM

By NED DEARBORN

BIRDS may be gathered about us in all seasons of the year with ease and certainty merely by offering what they desire. In winter they are often pushed for food, and if we supply this need they will report daily at the lunch counter and help to relieve the tedium of our indoor life. In summer they care less for food provided by their human friends, and other means must be sought to attract them about the home. They appreciate fresh water for bathing and drinking. A shallow pool of varying depth, if only a foot across, becomes on hot days a center of attraction for all the birds in the vicinity, and it may be made with little effort and material; only a small amount of cement is required, or, if that be lacking, a pan with stones in it set in the ground will be equally serviceable. Trees, shrubs, and vines bearing fruit relished by birds are great attractions in their season.

Birds are desirable about premises not only on account of their beauty and song, but because of their economic worth. They are especially useful as insect destroyers during the breeding period, when they have to work early and late to obtain sufficient food for their nestlings, and their movements at this time are more interesting than during any other season. There is, therefore, a double purpose in offering them special nesting facilities. If mud is available, swallows, robins, and phœbes will found and wall their nests with it. If we put out feathers, bits of wool, or twine, a dozen different kinds of birds will make use of them. If we furnish safe retreats in which they can rear their young comfortably, most of them will be occupied. In fact, no attraction for summer birds is more effectual than a series of houses suited to the needs and habits of the various kinds of house birds.

A few years ago only four species were commonly regarded as house birds—the house wren, the bluebird, the tree swallow, and the martin. Since the movement to protect birds and make neighbors of them began, however, their natures and needs have become better understood, and it is now known that many other species will avail themselves of houses constructed for them by their human friends. The practice of erecting bird houses in this country, while now nation-wide, is not so common and uniformly distributed as it should be, and more extended provisions of this nature cannot fail to result in a largely increased number of house birds.

The habit of nesting in bird houses has been adopted by individuals of many species which would not ordinarily be expected to make use of such homes, and this may be taken as indicating that it will become more general from year to year as facilities are afforded and as the number of birds hatched in houses increases.

That western wrens and bluebirds should take as naturally to artificial shelters as did their eastern relatives was to be expected. On the other hand, the use of houses by birds which until recently had persistently ignored them is surprising and must be considered a victory for those who have studiously attempted to enlarge their circle of feathered neighbors.

Woodpeckers, nuthatches, and titmice excavate their own houses, usually new ones each year, leaving the old homes to less capable architects. Builders of artificial houses generally go to the woodpecker for designs, and by varying styles to suit the tastes of different kinds of birds, have been rewarded by such tenants as chickadees, tufted titmice, white-breasted nuthatches, Bewick and Carolina wrens, violet-green swallows, crested flycatchers, screech owls, sparrow hawks, and even some of the woodpeckers, the master builders themselves. Flickers readily accept houses built according to their standards. Red-headed and golden-fronted woodpeckers are willing occupants of artificial houses, and even the downy woodpecker, that sturdy little carpenter, has, in one instance at least, deemed such a home a satisfactory abode in which to raise a family. Shelters having one or more sides open are

used by birds which would never* venture into dark houses suited to woodpeckers. They have been occupied by robins and brown thrashers, and, in one instance, by a song sparrow.

The number of house birds may be still further augmented as time goes on. All of the commoner woodpeckers are likely to be included, as are several of the small owls and wrens, and a few of the wild ducks, as the golden-eye. The wood duck is already known to use nesting boxes. Houses set close to streams in the western mountains will probably be occupied by ousels or dippers. Florida grackles sometimes breed in flicker holes and may be expected to occupy houses now and then. In every locality having trees there is a group of birds ready to appropriate houses when they have the opportunity.

House birds differ decidedly in their requirements. For those which usually excavate homes for themselves, the diameter of the entrance and the depth and diameter of the cavity must be in accord with their specific standards. Some birds are satisfied with almost any sort of a lodging. Bluebirds and wrens, for example, are content to build in tomato cans, although chickadees and nuthatches disdain them. Wood is a better building material than metal or earthenware. Entrance holes should be countersunk from the outside, to exclude rain. Heads of nails and screws should be set rather deeply and covered with putty. All houses should be easy to open for cleaning. A perch at the entrance is unnecessary, and may even be an objection, as it is frequently used by English sparrows while they twitter exasperatingly to more desirable occupants. To provide for proper ventilation a row of small holes is sometimes bored just beneath the eaves, but there should never be a ventilating hole lower than the entrance, and joints should be made tight, as drafts of air are dangerous. In case there is danger that rain may be driven in through the door, a small drainage hole, which will be covered by the nest, may be made in the middle of the floor.

The appearance and durability of houses are improved by a coat of paint. A neutral shade of green or gray is suitable for houses mounted in trees, while those on poles, being con-

spicuously placed, lend themselves harmoniously to the landscape when painted white.

The dimensions of nesting boxes shown in the following table are taken from the experience of successful builders and from measurements of woodpeckers' holes.

DIMENSIONS OF NESTING BOXES FOR VARIOUS SPECIES OF BIRDS.

SPECIES.	Floor of cavity.	Depth of cavity.	Entrance above floor.	Diameter of entrance.	Height above ground.
	Inches.	Inches.	Inches.	Inches.	Feet.
Bluebird.....	5 x 5	8	6	1½	5-10.
Robin.....	6 x 8	8	(a)	(a)	6-15
Chickadee.....	4 x 4	8-10	8	1½	6-15
Tufted titmouse.....	4 x 4	8-10	8	1½	6-15
White-breasted nuthatch..	4 x 4	8-10	8	1½	12-20
House wren.....	4 x 4	6-8	1-6	¾	6-10
Bewick wren.....	4 x 4	6-8	1-6	1	6-10
Carolina wren.....	4 x 4	6-8	1-6	1½	6-10
Dipper.....	6 x 6	6	1	3	1-3
Violet-green swallow.....	5 x 5	6	1-6	1½	10-15
Tree swallow.....	5 x 5	6	1-6	1½	10-15
Barn swallow.....	6 x 6	6	(a)	(a)	8-12
Martin.....	6 x 6	6	1	2½	15-20
Song sparrow.....	6 x 6	6	(b)	(b)	1-3
House finch.....	6 x 6	6	4	2	8-12
Phoebe.....	6 x 6	6	(a)	(a)	8-12
Crested flycatcher.....	6 x 6	8-10	8	2	8-20
Flicker.....	7 x 7	16-18	16	2½	6-20
Red-headed woodpecker...	6 x 6	12-15	12	2	12-20
Golden-fronted woodpecker	6 x 6	12-15	12	2	12-20
Hairy woodpecker.....	6 x 6	12-15	12	1½	12-20
Downy woodpecker.....	4 x 4	8-10	8	1½	6-20
Screech owl.....	8 x 8	12-15	12	3	10-30
Sparrow hawk.....	8 x 8	12-15	12	3	10-30
Saw-whet owl.....	6 x 6	10-12	10	2½	12-20
Barn owl.....	10 x 18	15-18	4	6	12-18
Wood duck.....	10 x 18	10-15	3	6	4-20

(a) One or more sides open.

(b) All sides open.

Ordinary tomato cans will be tenanted by wrens and bluebirds. The cans ought always to be placed in shaded places, as the metal becomes very hot in the sun.

Bird houses in the Southern States have long been made from gourds. The entrance is in the side and a drain hole in the bottom. A piece of wire through the neck for mounting it completes the house. A number of gourds thus prepared and strung on a pole seems to make a satisfactory tenement-house

for a colony of martins. Used singly they are equally well adapted to wrens and bluebirds. While gourds are not durable when exposed to the weather, they are easily replaced.

Ordinary wooden boxes, if clean, can be made into bird houses by merely nailing on a cover and cutting out an entrance hole. Such makeshifts are rarely weatherproof, and are never pleasing to the eye. Branches containing real woodpeckers' holes, when obtainable, are perhaps the best attractions that can be offered most house birds in the breeding season. By carefully fitting such a branch to a fruit or shade tree its foreign origin will scarcely be noticed. Either the top or bottom should be removable. Another way of making a log house is to split a straight-grained log two feet or more in length through the middle and then to cut out a cavity with a gouge. The excavations in the two halves can be made to match exactly by means of a pattern or template, having the size and shape desired for the proposed cavity through the plane of cleavage. The top of this house should be covered with tin or zinc, to keep out moisture. The halves should be fastened together with screws, to allow the house to be taken apart and cleaned.

Phœbes like to nest about buildings, and a simple shelf under the roof of a porch or shed is all they require. If, however, it is desirable to have them stay outside, the shelf must be provided with a roof. This shelf, if placed high under the eaves of a two-story building, may attract barn swallows; phœbes and robins also are likely to build upon it if it is not less than eight feet from the ground. In some cases it will be advisable to leave only one side open.

Martin houses are built on the apartment plan to satisfy the social instinct so marked in martins, but so conspicuously lacking in most other birds. They usually contain not less than ten or twelve rooms, and for this reason are relatively complicated, especially if they are miniatures of elaborate buildings, as is often the case. Like the single-room houses, they should be easy to inspect and clean from top to bottom, and, if possible, should be made proof against the English sparrow.

Cats and large snakes are enemies of birds, the former perhaps killing more birds than any other mammal. Trees and poles supporting houses should be sheathed with tin or galvanized iron, to prevent these enemies from climbing to the nests. Squirrels give more or less trouble by gnawing houses, eating eggs, and killing nestlings. Red squirrels, in particular, have a very bad reputation in this respect, and many experimenters keep their grounds free from them. Some regard flying squirrels as but little better than red ones. Even gray and fox squirrels are occasionally troublesome. It is not necessary, however, that bird-lovers should wage indiscriminate warfare against all squirrels. It is far better to adopt the rule never to kill a squirrel unless there is reason to believe that it has acquired the habit of eating eggs or young birds; the result will probably be that not more than one red squirrel in fifty nor more than one gray squirrel in a hundred will have to be killed. Where squirrels are numerous they give more or less trouble by gnawing and disfiguring houses. This damage may be prevented, however, by covering the parts about the entrance with tin or zinc.

The location of a bird house or food shelter has much to do with its success, for the reason that birds have decided notions as to proper surroundings for a dwelling. Martins prefer to breed near houses, but not within twenty feet of trees or buildings. Bluebirds are inclined to select orchards or pastures having scattered trees. Wrens, thrashers, and catbirds live in thick shrubbery. Robins like trees with sturdy trunks and branches. Titmice, nuthatches, and most of the woodpeckers are woodland species, although flickers and red-headed woodpeckers are more at home among the scattered trees of roadsides and pastures. Song sparrows frequent weedy swales and brush fences. Swallows do not enter woods, so that a house would be as attractive to them in one open place as in another. The eastern phœbe, the black phœbe, and the house finch, while not limited to the haunts of man, are noticeably partial to them. Crested flycatchers, screech owls, barn owls, and sparrow hawks are governed more by convenience than by taste; although normally inclined to hold



NORTH AMERICAN SEED-EATING SONG-BIRDS

1. Scarlet Tanager, or Black-winged Redbird. 2. Song Sparrow. 3. Baltimore Oriole.
 4. Rose-breasted Grosbeak. 5. Cowbird. 6. Cardinal Grosbeak. 7. Purple Finch.
 8. Indigo Finch.

All are adult males.

aloof from man, they have in many instances reared their broods in close proximity to dwellings. Barn owls, true to their name, accept suitable quarters in buildings without hesitation.

Before erecting bird houses one should first determine the kind of birds to which his premises are adapted. The question usually next arising is as to the number of birds that can be accommodated. Unless grounds are large, it is generally useless to expect as tenants more than a pair of each species, except martins. However, the singular intolerance shown by most birds during the breeding season to others of their kind does not operate between those of different species. A dozen different kinds of birds will pursue their several modes of hunting and raise their families on the same lot, but rarely two of the same sort. Of all our house birds, martins alone are social. The fact that there is a limit to the possible bird population on any given tract must be taken into consideration. When the probable tenants have been decided upon, the selection of sites is in order, for the site often decides the style of house that is to occupy it. In the final placing of bird houses, care should be taken to have them face away from the winds prevailing in stormy weather. The strongly developed homing instincts of birds can be relied on to attach them to the neighborhood where they first saw the light, and the identical pairs which nest in the houses provided for them one year will often return the next season to enjoy the same bounty and protection.

A FEW BIRD QUOTATIONS

Brighter plumes may greet the sun
By the banks of Amazon;
Sweeter tones may weave the spell
Of enchanting Philomel;
But the tropic bird would fail,
And the English nightingale,
If we should compare their worth
With thine endless, gushing mirth.

—From *The Bobolink*,
By THOMAS HILL.

Sweet, sweet, sweet! O happy that I am!
(Listen to the meadowlarks, across the fields that sing!)

Sweet, sweet, sweet! O subtle breath of balm,
O winds that blow, O buds that grow, O rapture of the Spring!

Sweet, sweet, sweet! Who prates of care and pain?
Who says that life is sorrowful? O life so glad, so fleet!
Ah! he who lives the noblest life finds life the noblest gain,
The tears of pain a tender rain to make its waters sweet.

—From *Meadowlarks*,
By INA COOLBRITH.

But cheerily the chickadee
Singeth to me on fence and tree;
The snow sails round him as he sings,
White as the down of angels' wings.

—From *Midwinter*,
By JOHN TOWNSEND TROWBRIDGE.

Ah, may I be as cheerful
As yonder winter birds,
Through ills and pretty crosses,
With no repining words;
So, teaching me this lesson,
Away, away, they go,
And leave their tiny footprints
In stars upon the snow.

—From *Winter Birds*,
By GEORGE COOPER.

OUR LITTLE BROTHERS

From THE CORNELL RURAL SCHOOL LEAFLET

TOADS

VERY few boys and girls know much about toads, and this is most unfortunate. The toad is really a friend to the gardener and to the farmer, but, owing to the ignorance of those whom it has befriended, it has been subject to many persecutions. It lives entirely on small animals, usually insects; it is not discriminating as to what kinds of insects, but, because of the places that it haunts, it usually feeds on those that are injurious to grass and plants. Yet the toad is not entirely a creature without judgment in the matter of its food. It will walk around a squirming earthworm until it can seize it by the head, thus avoiding having its throat rasped by the thorny hooks that extend backward from each segment of the worm. When swallowing a large mouthful, the toad closes its eyes, but whether this aids the process of swallowing or is merely an expression of satisfaction is hard to determine.

The toad drinks, not by taking water through the mouth, but by absorbing it through the skin. When it wishes to drink, it stretches itself out in shallow water and thus satisfies its thirst. A toad will waste away and die in a very short time if kept in a dry atmosphere.

The common American toad, though extremely variable in color, usually closely resembles the soil in which it lives. It is nearly always yellowish brown, with light spots and reddish or yellowish warts. There are likely to be four irregular spots of dark along each side of the middle of the back. The under parts are light, often somewhat spotted. The throat of the male toad is black, and he is not so bright in color as his mate. The warts on the back of the toad are glands which secrete a substance disagreeable to the taste of its enemies. This is especially true of the glands in the elongated swelling, or wart, above and just back of each ear, which are called the parotid glands. These glands excrete a milky, acrid sub-

stance when the toad is seized by an enemy, although snakes do not seem to be disturbed by it. Some persons think that the toad is slimy, but this is not true; the skin is perfectly dry. The toad feels cool to the hand because it is a cold-blooded animal; that is, an animal whose blood is of the temperature of the surrounding atmosphere. The blood of a warm-blooded animal has a temperature of its own, which it maintains whether or not the surrounding atmosphere is cool.

The toad's eyes are elevated above the head and are, therefore, thoroughly efficient. They are really very pretty eyes, the pupil being oval and the surrounding iris like shining gold. When the toad winks, the eyes are pulled down into the head. The lids rise from below, and are similar to those of birds' eyes.

The two tiny nostrils are black and easily seen. The ear is a flat, oval spot behind the eye and a little lower down; in the common species, it is not quite so large as the eye. This is really the eardrum, since the toad has no external ear as we have. Its mouth is wide, and its jaws are horny. It does not need teeth, since it swallows its prey whole. Its tongue is attached to the lower jaw at the front edge of the mouth. From this position it can be thrust far out. Because its surface is covered with a sticky substance, the tongue adheres to any insect that it touches, and thus the toad obtains its food.

In breathing, the toad swallows the air, a process shown in the constant pulsation of the throat. The toad also sheds its skin, which it swallows—a very strange habit.

The toad is a good jumper and, indeed, needs to be. Its strong hind legs have feet that are long and strong and armed with five toes, which are somewhat webbed, for use in swimming. The front legs are shorter, and each front foot has but four toes.

The toad has an interesting habit of changing color to match its background, which is undoubtedly a beneficial habit, making it invisible to its enemies. If we take a toad from the garden and put it in a white enameled pan or washbowl in which there is a little water, it will in a few hours change

to a lighter color; soon after, if we put it back on the brown earth again, it will regain its brownish hue.

The toad prefers to live in cool, damp places. It burrows in the earth by kicking backward with its strong hind legs and soon covers itself completely. It remains in its burrow or hiding-place usually during the day and comes out to feed at night, when there are plenty of insects flying about. It is interesting to observe that toads have discovered that the vicinity of street lights is a good place to find insects, and they gather there in numbers. In winter they burrow deeply into the ground and go to sleep, remaining dormant until the warmth of spring awakens them.

The song of the toad is a pleasant crooning, made when the throat is puffed out in globular shape, forming a vocal sac. The evenings in spring are surely much pleasanter because of the toad music.

Early in the spring the mother toads seek their native ponds and there lay their eggs for the coming generation. The eggs are laid in long strings of jelly-like substance, and are dropped on the bottom of the pond or attached to water weeds. At first the eggs are spherical, but they elongate as they develop, and soon the tadpoles may be seen wriggling in the jelly-like mass. After four or five days the tadpoles work their way out and swim away. At this stage they are small, elongated creatures, with no noticeable head. Soon the head develops. For some time there is no mouth but a V-shaped sucker where the mouth should be, by which the little creature attaches itself to water weeds when resting. At this stage if we look at a tadpole with a lens, we can see a little tassel of short threads on each side of the throat. These are gills, comparable to the gills of fishes; the blood passes through them and is purified through their very thin walls by coming in contact with the air that is mixed with the water. After about ten days, these gills disappear beneath a membrane which grows down over them. They are still used for breathing, however, the air which passes through them being drawn in through the nostrils and mouth, and passing out through an opening at the left side of the body. This opening, or

breathing pore, may be easily seen in the large tadpoles. When the left arm develops, it is pushed out through this convenient opening. When about ten days old, the tadpole has developed a small round mouth, which is provided with horny jaws for biting off pieces of plants. Later this mouth becomes larger and wider and more like that of a toad.

The tadpole's eyes are hardly to be seen at first, but later they become prominent. The tadpole's tail is long, flat, and surrounded by a fin, and is a most excellent organ for swimming. There is a superstition that tadpoles eat their tails. In one sense, this is true, because the material that is in the tail is absorbed into the growing body; but the last thing a tadpole would do would be to bite off its own tail. If, however, some other tadpole should bite off its tail or its growing leg, these organs would conveniently grow out anew.

When a tadpole is a month or two old, the time varying with the species, its hind legs begin to show, at first mere buds, which later push out into real legs. About two weeks later, the front legs begin to appear. These are used for balancing the creature in the water. The hind legs meanwhile are used for pushing and swimming as the tail becomes smaller, until at last some rainy day the little tadpole feels that it is fit to live as a land animal. It may not be a half inch in length, but it swims to the shore, lifts itself on its front legs and walks off, toeing-in with a very grown-up air, and hops away to hide under some leaf or other shelter. When great numbers of these tiny toads come out of the water during a rain-storm, ignorant persons conclude that they have rained down.

SUGGESTIONS FOR STUDY

Make a moss garden in a glass aquarium jar thus: Place some stones or gravel in the bottom of the jar; cover the stones with moss; cover the jar with a wire screen. The mass should be deluged with water at least once a day, and the jar should be placed where the direct sunlight will not reach it. In this jar keep a toad until you have become acquainted with it in every particular. The best way to feed

the toad in captivity is to catch insects and put them alive into the jar, but the toad can be fed with bits of raw meat, particularly liver, held in front of its nose and moved so as to appear alive.

To make a tadpole aquarium, take a tin or agate pan or an earthenware washbowl. Place in this some small stones at the bottom, building up one side higher than the other so as to have both shallow and deep water. Take some of the mud and leaves from the bottom of a pond, and place them on the stones. Plant in the mud some of the weeds you find growing under water among the stones. Place a pan thus prepared where the sun will not shine directly on it. Bring a pail of water from the pond, and pour it very gently in at one side of the pan so as not to disarrange the plants. Fill the pan nearly to the brim. In this pan place not more than a dozen tadpoles, because the amount of food on the plants and in the mud will supply only a few individuals. Every week add a little more mud from the bottom of the pond or another stone covered with slime. Also place at one side a little yolk of hard-boiled egg. Remove the outer skin from one side of a tulip leaf so as to expose the pulp, and give a leaf to the tadpoles every day or two.

FROGS

THE most abundant form is the leopard frog, whose upper parts may vary from bronze to bright green, with irregular scattered spots occupying less surface than the space between them. Its under parts are white.

This frog comes out of hibernation with the advent of spring. Almost immediately it migrates to swampy localities, where the eggs are laid in flattened, submerged, jelly masses, with from 3,500 to 4,500 eggs in a mass. These hatch in ten to twenty days, and ninety days after the eggs are laid the tadpoles lose their tails, assume legs, and change to the adult form.

The pickerel frog resembles the bronze-colored leopard frog, except that the spots are somewhat square and occupy far more surface than the space between them. The under parts of the legs and the belly are orange-yellow. The pickerel frog appears in the spring, fifteen or twenty days after the leopard frog. The eggs are deposited in globular, submerged masses, with from 2,000 to 3,000 eggs in a mass. The individual eggs have a decided yellow color. The tadpoles transform about ninety to one hundred days after the eggs are laid.

The wood frog in color is either light or reddish-brown above, with a darker brown streak, or mask, on either side of the head. Underneath it is a glistening white. It appears in early spring, and immediately begins to lay globular, submerged masses of eggs, with from 2,000 to 3,000 eggs in a mass; then it hastens away to the woods again. The eggs hatch in twelve to twenty-four days. The tadpoles transform about ninety days after the eggs are laid.

The northern wood frog in general appearance is like the wood frog, but has shorter hind legs. The hind leg in length to the heel does not exceed the combined length of the head and body, while in the wood frog it does. It comes out of hibernation early in the spring, lays submerged, globular masses of eggs, attached to sticks or water plants. These hatch in two or three weeks, and the young remain in the tadpole state about one hundred days.

The green frog is larger than the leopard frog, and has two ridges down its back. The forward upper parts are bright green, the posterior region brown or olive. The ear plate, or tympanum, is as large as the eye in the female; in the male it is larger. The under parts are white, with some marbling; in the male the throat is yellow. The green frog appears about a month after the beginning of spring and begins spawning about five weeks later. The spawning may continue for two months. The egg mass, composed of from 3,500 to 4,500 eggs, is laid among vegetation and is one flat, continuous film less than one foot in diameter on the surface of the water. The eggs hatch in four days. Eleven to thirteen months later the tadpoles change to adults.

The bullfrog is much larger than the green frog, but has not the two ridges down its back. It appears from hibernation about a month after the green frog. The eggs are laid from fifteen days to six weeks after the adults first appear. They are deposited in a frothy film, which floats on the water among brush or near the roots of upturned stumps. The film is over a foot in diameter. The tadpoles live as such for two years before they change in July to the adult form.

The northern, or mink, frog, like the bullfrog, has no fold of skin on either side of the back, the web leaves one joint of the fourth toe free, and the male has the cardrum larger than the eye. The mink frog is much smaller than the bullfrog, the body being from two to three inches in length. It is a light olive with irregular spottings on the posterior back and sides and with the hind legs spotted or banded. It lives along streams, as well as lakes and ponds. It breeds in June and July, and lays its egg masses attached to water plants. The tadpole stage probably occupies a year, if not longer.

BATS

BATS are very difficult to identify unless one discovers them in the daytime and can observe the size and the color.

The little brown bat is perhaps the most common species, often congregating in large colonies in steeples or deserted attics during the day and coming out at dusk to forage on the mosquitoes and gnats swarming above the tree tops or to chase the moths beneath the arc lamps of the city streets. This bat is uniformly dark brown, and about three and one-half inches long from the tip of its nose to the tip of its tail.

The large brown bat is very similar in color to the little brown bat, but is considerably larger, measuring about four and one-half inches in length.

The red bat is fairly common, and can frequently be identified at dusk by its more pointed wings and quick, erratic flight. It is of a beautiful brownish-red in color, frosted with white. It does not congregate in large colonies, and is more arboreal than either of the brown bats, spending the day clinging to the leaves or the branches of trees.

The silvery bat is another tree-frequenting bat that spends the day under loose bark or in hollow trees. During the fall these bats gather in large colonies. The silvery bat is black in color with the tips of the fur frosted with white, as in the case of the red bat.

The pipistrelle bat is about the size of the little brown bat, but is yellowish-brown in color and has a grizzled appearance, due to the fact that each hair is banded with three different shades of brown.

The hoary bat measures five and one-quarter inches in length. It is somewhat similar to the red bat in appearance, but is much grayer. It is a Northern species and is found in most parts only during October when on its way south, for it migrates. Little is known regarding its spring migration.

The hoary bat is not the only bat that migrates, for this is the rule rather than the exception with Northern bats. When their insect food begins to fail in the fall, they must either leave for the South, like the birds, or else go into hibernation, like the woodchucks and the chipmunks. It is known that at least some individuals of the little brown and the large brown species do hibernate, for often they come out of hiding during warm days of winter.

Bats bring forth their young in the crevices of buildings, in caves, or in hollow trees, and build no nests whatsoever. When the young are small, they are carried about clinging to the breasts of the mothers; but as they get larger, they are left clinging to some support while the adults go in search of food. Usually but one young is born, although some species regularly have two.

Bats are repulsive to some persons who know little about them. They do have a strange appearance, but in reality are harmless, interesting, and most beneficial creatures to have

about the house, and should not be killed merely because they venture inside dwellings.

There is a popular notion that bats carry bedbugs, and this is true, with the restriction, however, that the species of bedbug carried is different from that infesting human habitations, and will not bite anything but a bat.

RABBITS AND HARES

THE true rabbits dig burrows, but the hares do not, and this is the habit that distinguishes between them. The varying hare, or white rabbit, which was common fifty years ago, has become practically exterminated. It was one of the most interesting of the species, because it changed its coat to white in winter.

The two most noticeable features in the general appearance of a rabbit are its long ears and its long hind legs. These two characters are closely connected: the long ears are always on the move to catch any sound of danger, and as soon as this is heard its direction is determined; then the long hind legs are used to help the little creature go in the other direction in mighty leaps. The constantly moving nose probably also has to do with sniffing danger, for it is only through sure flight that these little animals may escape from the many enemies that surround them. The rabbits are peculiar also in that the bottoms of their feet are hairy. The front feet cannot be used to hold food to the mouth, as is true of squirrels and mice, but this is not needed, since the rabbit eats on the ground.

The cottontail does not dig a burrow, but sometimes occupies the deserted burrow of a woodchuck or a skunk. Its nest is called a form, which merely means a place beneath a cover of grass or briars, where the grass is beaten down or eaten out for a space large enough for the animal to sit in. The mother makes a soft bed for the young, using grass and her own hair for the purpose; and she constructs a coarse,

felted coverlet, under which she tucks her babies with care every time she leaves them. When they are about three weeks old they can run rapidly.

Rabbits have two long, gnawing teeth in the front of each jaw. The remaining teeth are broad grinders in the back of the mouth. All rodents except the rabbit have no teeth between the gnawing teeth and the grinding teeth, but rabbits have a small pair of teeth arranged one on each side of the upper long ones. These are left-overs from rabbit ancestors which evidently had four gnawing teeth on each jaw. It is with the front gnawing teeth that the rabbit hurts young trees by girdling them in winter when driven by starvation to feed on the bark. The cleft in the upper lip leaves the gnawing teeth free.

The varieties of rabbits and hares found under domestication are: Belgian hare, fawn to red-brown in color, medium in size, long and graceful; bred for the market. Common rabbit, which may be white (albino), black, maltese, or with broken colors. Angora, white or broken-colored; a small to medium breed, with short ears and silky hair; a purely fancy breed. Lop-eared, fawn to brown in color; very large ears, which droop; this is a fancy breed, very tender, requiring artificial heat in winter. Himalayan, a small medium breed; white, with black ears, nose, and feet; short hair, alert and active; a very fancy breed. Flemish Giant, very large; fawn to brown in color; seldom raised.

SQUIRRELS

THERE are several kinds of squirrels, which differ widely in their appearance and habits—red, gray, fox, and flying squirrels, chipmunks, and woodchucks.

RED SQUIRREL

The red squirrels, or chickarees, are well-known little "chatterboxes," found in the woods, even among the densest

evergreens. Their size is small—they are twelve and one-half inches in length; their backs are red, varying in shade, and the under parts are white or gray. They are the proud possessors of bushy tails. They are queer bundles of characteristics, inquisitive, audacious, insolent, and mischief-loving, but intelligent, persevering, industrious, and clever, with an irresistible sense of humor. Chattering and busy throughout the day, they cut off pine cones before they are ripe and chestnuts while still in the bur. They store mushrooms in the forks of trees, awaiting the time of need. Their food is varied: nuts, acorns, seeds and roots, buds and leaf stems of certain trees, several species of toadstools and other fungi, seeds from cones of pines and spruces, fruits and berries, beetles, birds' eggs, and even young birds. Scraps of meat or fish prove very acceptable whenever available. The red squirrels are expert climbers and good swimmers, and make good time in covering the ground. They travel by bounds, and leave footprints that consist of three or four impressions, the hind feet falling just ahead of and outside the fore feet. Unlike the track of the rabbit, the toe marks are distinct. In the tree tops the red squirrels are perfectly at home and can climb out on the smallest twigs. They often establish regular paths from their nests to their feeding grounds, passing from tree top to tree top with quick, light jumps. These squirrels do not hibernate, but retire to their nests for the worst storms. The nests may be located in a hollow limb, a hollow in the ground, or a hollow log; or sometimes the squirrels build outside nests of twigs and bark, which are great, ball-like structures, sixteen inches across with a chamber of six inches. These they often place high up in evergreen trees. The four to six young are born about the first of April.

GRAY SQUIRREL

The gray squirrels are larger than the red, being nineteen and three-quarters inches in length. Their backs are a clear silvery gray in winter, tinged with yellow in summer; the under parts are white, occasionally blotched with rust color; the ears are whitish. A black phase of this animal is rather

common, both colors being found in one litter. Occasionally white forms are recorded, as is true also of the red squirrel. The gray squirrels are not fond of evergreen forests, as their smaller brother is, but prefer the hardwood groves, especially the beeches, which supply them both nuts and favorable sites for their outside nests. These water-tight apartments are built wherever the weather is not too severe, and whenever a convenient woodpecker's hole or a hollow tree or limb is not found. From below, these structures look like crows' nests, as they are built on platforms of twigs. They are so well covered that they shed the rain. Leaves are used to a considerable extent in the construction of all the nests. Nuts are the principal food of these squirrels, and they begin to eat these long before they are ripe; and they store large quantities for winter and spring. They do not gather these together in one place, but prefer to hide a few in one spot. To find them again, they must be largely dependent on their acute sense of smell. They have a saucy cry of *qua-qua-qua—qua-a-a*. These alert squirrels usually escape capture by clinging to the side of the branch or trunk of the tree opposite the enemy, whether hawk or boy; but in captivity they are easily tamed and make very intelligent pets.

FOX SQUIRREL

The largest of the squirrels are the fox squirrels, which are twenty-three inches long. Their backs are always tinged with rust color; the under parts are never pure white, varying from bright rust color to rusty white; and the ears are rust-colored. Black and semi-black individuals are found also in this species.

FLYING SQUIRREL

The little flying squirrels, only nine inches long, are quite unlike the other squirrels. They have what none of the others have—broad, furry membranes connecting their front and hind legs. With their beautiful bright eyes, their drab backs somewhat shaded with russet, and their white under parts, they are as dainty animals as one could wish to see.



TWO SQUIRRELS

From a Painting by Albrecht Duerer.

They live on nuts, seeds, and buds, and also on beetles and perhaps other insects. Occasionally they eat flesh. Their nests are in hollow trees, often in deserted woodpeckers' holes. Here several of them often live together, and they may be aroused easily and driven out by hammering on the tree trunk. In accordance with their nocturnal habits they come out just at nightfall, climb to the top of a tree, and sail to the foot of another tree perhaps fifty yards away. Then, climbing this tree, they glide to another. They live in seclusion during the severest weather, but it is not known that they regularly hibernate. The young, numbering from three to six, are born early in April.

CHIPMUNK

The chipmunks are ten inches in length and reddish or yellowish-brown in color, with five black and two whitish stripes down their backs. They are very fond of nuts, preferring beechnuts; but they will eat roots, corn, and other grain, and the larvæ of certain insects. They put away large stores in their burrows, for they stay in winter quarters from the middle of November until March or April. Sometimes they come out and look around on a bright winter day. From one nest occupied by four chipmunks there was once taken a quart of beaked hazelnuts, a peck of acorns, some Indian corn, two quarts of buckwheat, and a very small quantity of grass seeds. All this they had industriously gathered and carried to their storehouse in the large pouches of their cheeks. They often have temporary "caches" carefully hidden among the leaves for one of their "cheek-loads." The chipmunks are diurnal in habit and stay on the ground most of the time, except when some venturesome sprite goes after seeds in a tree. When surprised by a passer-by, they utter a sharp *chip-per-r-r-r* and dash for a retreat, preferring a loose brush heap, a rail fence, or a similar structure, where they can watch readily and change their position frequently. Their homes are long, crooked tunnels in a bank, with entrances in a thicket. The burrows are one and one-half or two inches

in diameter, and have a network of branches. The nests are deep in the ground. The four or five young leave the nest by June and are full-grown by August.

WOODCHUCK

One scarcely associates the slow-moving woodchuck with its stout heavy body, with the other spry squirrels to which it is related. Its tail is short and densely covered with long, rather stiff hairs. In color the coat is grizzly gray varied with chestnut, yellow, or black, with the under parts reddish. Partly or wholly black individuals are not uncommon, and white ones are seen occasionally.

The woodchuck is a woodland animal, but prefers to have its home on the edge of a sunny opening or near a rolling pasture. The burrows are of varying complexity from seven to fifty feet in length, and with one or more nesting chambers. The woodchuck chooses woodland burrows in which to hibernate with its mate. Although sluggish in movement, rarely climbing trees, swimming poorly, and returning to its burrow whenever pursued, it is, when at bay, a fighter that knows no surrender.

The four or five undeveloped young are born in the underground nest about the end of April and remain in the den until mid-June. The male woodchuck sometimes returns home when the young can venture forth. It has been reported that the woodchuck can sing, producing birdlike notes resembling those of canaries.

Although the woodchuck is a profound hibernator, it sometimes comes out while the ground is still covered with several feet of snow. The tracks it makes are commonly in pairs, a few inches apart, one a little in advance and showing distinct thumb marks.

The favorite foods of the woodchuck are grass and clover.

THE TINY KINGDOM OF THE
FIELDS AND AIR

Hurt no living thing
Ladybird, nor butterfly,
Nor moth with dusty wing,
Nor cricket chirping cheerily,
Nor grasshopper so light of leap,
Nor dancing gnat, nor beetle fat,
Nor harmless worms that creep.

By CHRISTINA G. ROSSETTI.

THE HONEY BEES

By TICKNER EDWARDS

WHATEVER confidence one may place in beekeepers' assertions that their bees never sting, it is a bold man who can preserve entire equanimity when bees are settling continuously on his hands, his face, his clothing, and a whole flying squadron of them are shrilling vindictively about his ears. Nothing will come of it, he knows, if only he can keep still. But the tendency to turn and flee, or at least to beat off these atoms with wildly waving arms, is all but irresistible for the novice.

These first deterrents, however, being happily overcome, the watcher is sure to be caught up, sooner or later, in the sheer fascination of the thing, and to find himself recklessly, almost breathlessly, looking on at what is nothing else than a great informing pageant of life.

He stands, as it were, a stranger at the gates of a city, inhabited by the most interesting, and in some respects the most advanced, people in the world.

In and out through the yawning entrance-gate of the city, under the hot May sunshine, there are thousands of busy people coming and going. The broad threshold of the hive is completely hidden under opposing streams, the one setting out toward the fragrant fields and hedgerows, the other tumbling and seething in, almost every bee dragging after her some kind of mysterious treasure.

The outgoing bees start on their journey in two different fashions. Some emerge from the hive and rise at once on the wing, lancing straight off into the sunshine; and these are foragers, who have already made several journeys afield since the sun broke, hot and rosy, over the eastward hill. But others, essaying their first excursion for the day, creep out

of the murmurous darkness of the hive, and come with a little impetuous rush to the edge of the alighting board. Here they pause a moment to flutter their wings and rub their great eyes free of the hive-twilight. And then they lift into the air, hover an instant with their heads toward their dwelling, taking careful stock of it, sweep up into the blue, and volley away with the rest toward the distant hill-side, white with its bridal wreath of clover-bloom.

The homing bees move much more sedately. They come sailing in like bronze argosies laden to the water's edge. Those bearing full sacs of clover-juice for the honey-making seldom carry an outside load of pollen as well. They have all to do in bringing their distended bodies to safe anchorage on the entrance-board, and charge headlong into the hive, possessed of only one idea—to hand their garnered sweets over to the first house-bee they chance upon, and then to hurry out in search of another load. The pollen-bearers are impelled by the same white-hot energy; but their cargoes are infinitely more cumbersome, and demand a more leisurely pace. Some, with panniers heaped up with a deep orange-colored material, must rest awhile on the threshold before gathering energy enough to drag their glowing burdens through the city gate. Others just fail to make the harbor, and sink down onto the grass below, to wait for the same freshet of strength that is finally to bring them into the security of the populous haven. Scores of them do not try for harbor at first tack, but, coming safely into the calm waters of the garden, rest awhile on the nearest leaf or blossom, panting and tremulous, until they are able to wear sail for the last reach home.

There is infinite diversity in the loads of these pollen-carrying bees. Hardly a color, or shade of color, in the rainbow fails to pass during every moment across the thronging way. Every bee carries a half-globe of this substance, beautifully rounded and shaped, on each of her two hind-legs. It is possible, by marking the color of her burden, to tell with certainty what flower she has been plundering on each of her trips. This bright orange, which makes always the brightest and heaviest bales in the stream of merchandise, is from

the dandelions. White clover and red clover load up the little hive coolies with different shades of russet. From the apple orchards come bursting panniers of pale yellow; the blackberry blossom yields pollen of a delicate greenish-white. When summer comes, and the poppies make scarlet undertones, these winged merchant-women stream homeward, their pollen-baskets laden with funereal black.

But, if you watch a hive at work on any bright spring or summer morning, you will see single bees occasionally pass with loads whose source has never yet been fathomed. The lean, glistening, rufous stuff that is continually borne through the hustling crowd is resin gathered from poplar or pine, and used to glue the hive down to its base-board, or to stop up draughty crevices and useless corners, or, diluted with varnish, to paint the honeycombs with an acid-proof, preservative film. But now and then comes a bee with a load whose color shines up like a danger-signal in the darkness. Brilliant scarlet, or soft rose-crimson, or pale lavender, or gleaming white—who shall say in what far, forgotten nook of the countryside she has been adventuring, or what rare blossom she has chanced upon in the wilderness, and, despoiling it of its maiden treasures greedily, has quickened into duplication the beauty that was its reason for life?

Yet the greatest wonder about all this pollen-gathering is that each separate load has been taken entirely from one species of flower. The little half-spheres are packed into the pollen-cells indiscriminately, orange on brown, pale yellow mingled with green, or buff, or gray. But each pair of panniers, representing a single journey, contains the pollendust of one kind of blossom alone.

All this incessant coming and going of the busy foragers is alluring enough to the looker-on, but there is evidence of many other activities equally interesting. The work of collecting nectar and pollen is obviously only a part of the duties of this spinster-race. Here and there in the seething, hurrying crowd there are bees who do not move with the rest, but, anchored securely in the full force of the living current, with heads lowered and turned toward the hive, are engaged in

fanning their wings, and this so swiftly that nothing of the wing but a little gray mist can be seen. Looking more carefully, you will make out that these bees are arranged in nearly regular rows, one behind the other, in open order, so that the conflicting tides of foragers can pass uninterruptedly between. If the watcher is bold enough to bring his ear down to the level of the hive, he will make out a steady hissing noise that rings clear above all the din and turmoil made by the incessant travelers to and fro. These rows of fanners are seen to stretch from the hive-door right to the edge of the footplate, but principally on one side; and still closer observation will reveal the fact that there is a regular system of relief among them. Though the general volume of sound never abates one jot, every few minutes one or another of these stationary bees moves away, her place being immediately taken by another, who settles down to the common task in line with the rest. The reason for all this is plain enough: the fanners are engaged in ventilating the hive, drawing a current of vitiated air through the entrance on one side, which flanks, but does not oppose, a corresponding current of pure air sucked in on the other.

All through the warm days of spring and summer this fanning squadron is constantly at work; nor does it cease with the darkness. Chill nights find the ranks weakened and reduced to perhaps only a few bees, or even to none at all when a cold snap of weather intervenes. But in the dog-days, or, as the ancients used to say, when Sirius, the honey-star, is shining, the deep sibilant note of these fanners rises, in a populous apiary, almost to the voice-strength of a gale of wind. To come out then under the stars of a summer night, and stand listening in the tense, fragrant darkness to this mighty note, is to get an impression of bee-life unattainable at any other season.

The freshman at this fascinating branch of nature-study, brought out into the quiet night to hear such Gargantuan music, is always strangely affected by it, some natures incredibly so. In all the great placid void of darkened hill and dale around him, in the whole blue arch overhead, alive with the flinching

silver of the stars, there is no sound but a chance trill of a bird, or bark of a dog on the distant upland, or, now and then, the droning song of a beetle passing invisibly by. All the world seems at rest, save these mysterious people in the hives; and with them the sound of labor is only redoubled. Bending down to the nearest hive in the darkness, the note comes up to one like the angry roar of the sea. A light brought cautiously to bear upon it, discloses the alighting-board covered with rows of bees, working, as it were, for their lives; while other bees continually wander in and out of the entrance—the sentries that guard it night and day, just as soldiers guarded the gates of human cities in olden times. The novice at bee-craft, even the most staid and matter-of-fact, is invariably plunged into marveling silence at the sight. But if the night be exceptionally hot and oppressive, and the fanning army unusually large, the bee-master with an eye for dramatic effect generally finishes the tyro's wonderment by showing him an old trick. He lowers the candle until the flame is just behind the squadron of ventilating bees, and at once all is darkness; the current of air drawn out of the hive has proved strong enough to extinguish the light.

It has been said that there are guard-bees who watch the hive-door day and night. To the unskilled human eye one bee looks very like another, and it is difficult to understand how, in the many thousands that pass, the guards manage to detect an intruder so unerringly, and to eject her with such unceremonious promptitude as is always shown. Probably it is not by sight alone that these occasional interlopers are singled out. The sense of smell in the honey-bee is extraordinarily acute, and this, no doubt, assists the guards in their difficult work. It is well known that a queen-bee must possess a very distinct odor, as her mere presence abroad, even when shut up in a box, will attract the drones from all quarters. In all likelihood the peculiar aroma from each queen-bee impregnates the whole colony, and thus the guard-bees are able to distinguish their own kin from that of alien stocks.

Still watching the outside life of the hive in the old beegarden, many other interesting things come to light. In such

an establishment, even if it be only an old-fashioned skep, perhaps more than twenty thousand individuals are located; and obviously some system of cleaning and scavenging is indispensable. This work can be seen now going on uninterruptedly in the midst of all the other busy enterprises. Every moment bees come laboring out, bearing particles of refuse, which they throw over the edge of the foot-board, and at once shoulder their way back for another load. Other bees appear, carrying bodies of comrades who have died in the hive, and every now and then one comes struggling through the crowd, bearing high above her a strange and ghastly thing, perfect replica of herself, but white throughout save for its black, beady eyes. This is the unborn bee, dead in its cradle-cell.

There is still another kind of work going briskly forward round the gates of the bee-city. Certain among these stay-at-home bees seem to exercise a sort of common overseership. They help those weighed down with too heavy a cargo to reach the city gates. If a lump of pollen is dropped in the general scuffle, these bees seize it and take it into the hive. Sometimes a bee comes eddying downward, smothered from head to foot with pollen, like a golden miller, and she is immediately pounced upon by these superintendents, and combed free of her incommensurable treasure. Others see to the grooming of the young bees, about to essay their first flight. The youngster sits up, protruding her tongue to its fullest extent, while half a dozen bees gather around her, licking and stroking her on every side. At last her toilet is done, and she is liberated, when, with a flutter of her wings, she lifts high into the blue air and sunshine and makes off with the rest to the clover-fields, glittering afar off in the joyous midday light.

Insensibly the hours have worn on—it is noon—and the tense thronging life, the deep, rich labor-song, of the beegarden, seem to have reached their height. But suddenly a greater noise than ever arises on all sides: a steady stream of bees, larger and bulkier than the rest, is pouring out of every hive. The drones, the lazy brothers of their laborious

vestals, have roused at last from their sleep and are coming abroad for their daily flight. In twos and threes, in whole battalions, they hustle out, and begin their noontide gambols about the hive, filling the air with a gay, roistering song. In a little while they will be all gone to their revels, and the bee-garden will seem, by comparison, strangely quiet. But now the sudden accession of energy is unmistakable. With the awakening of the drones there seems to be a new spirit abroad. The air is no longer filled to overflowing with busy foragers. Many of these have joined the dance round the hives, so that each bee-dwelling is the center of a singing, gamboling crowd moved rather by a spirit of play, almost of idleness. But this brief moment of relaxation soon passes. The drones betake themselves to their pleasuring in the fields. The noisy midday symphony dies down to the old steady monotone of work.

And the watcher at the gates of the bee-city turns to retrace his steps down the flower-garlanded way of the old pleasance, satiated with wonders, yet not satisfied, but curiosity only quickened a thousandfold by that which has been inexorably held from him, a glimpse of what is happening behind those baffling walls.

Watching bees at work for the first time through the glass panels of an observation hive, there is something curiously humanlike in their movements over the crowded cones, and the old comparison of a bee-hive to a city of men is never out of mind. There are the incessant hurryings to and fro; chance meetings of friends at odd street corners; altercations where we can almost hear the surly complaint and tart reply; busy masons and tillers and warehouse hands at work everywhere: a hundred different enterprises going forward in every thronging thoroughfare or narrow side-lane, from the great main entrance to the remotest drone-haunted corner of the hive.

You will see the huge, full-bodied queen laboring over the cones from cell to cell, with a circle of attendants ever about her. In the highest storeys of the hive the honey-makers are at work, pouring the new-garnered sweets into the vats, or

sealing over with impervious wax the mature honey. Where the nurseries are established, in the central and warmest region of the hive, the nurse-bees are hurrying incessantly over the cones, looking into each cell to mark the progress of the larvæ, giving each its due ration of bee-milk; or, when the time arrives, walling up the cell with a covering that shall insure its privacy, but freely admit the air. Here and there the young bees have awakened from their transforming slumber, and are clamoring at the stoppings of their prenatal tombs, gnawing their way out vigorously, or thrusting forth red, glistening, ravenous tongues, eager to end their long fast. Where these raw youngsters have at last won their way into existence, they can be seen assiduously grooming themselves, or searching the neighboring comb for honey, while the nurse-bees are busy cleaning out the cells, just vacated, to make them ready for the queen when she comes by on her next egg-laying round.

And all these operations are going forward simultaneously on an incredibly large scale. Certain amazing scraps of information are given to the wondering onlooker, which he hears, but can, at this stage in his progress, seldom rightly estimate. He is told that the queen is the only mother-bee in the colony, large as it is; that, in the prime of her maternity, she will lay as many as three thousand eggs a day; and that she has the power to produce either male or female eggs, or none at all, at will. He is told that, except when she leads forth the swarm, she goes out of the hive only once in her life, and this is her wedding-trip.

In the heat and glow of the fine June morning you may see her, the young virgin queen, making ready for her nuptial flight.

At first she is all hesitancy; wandering to and fro amidst the crowd on the hive-threshold; coquetting with the sunshine; loath to return to the dim, pent, murmurous twilight she has forsaken, yet hardly daring to launch herself on wings that are still untried.

As she stands hesitating, the hot June sun falls upon her, laying her in molten gold. The blue sky beckons her upward.

All the world of color and incense and life calls her to her wooing, and she must needs obey. With a little glad flutter of the wings, she breaks at last from the scrambling company about her, and soars up into the light.

Warily now she hovers, taking careful stock of her home and its surroundings. Then round and round, in ever-widening and lifting circles, each sweep upward giving her a broader view of the world that lies beyond. And then away into the blue sky so swiftly that no human eye can follow; yet only for a short flight. She is back again now, almost before you have missed her, and hurrying, frightened at her own audacity, into the old safe gloom of the hive.

Thus she dallies, to and fro between the sunshine and the darkness, each time adventuring a little farther into the blue playground of the upper air, until at length the inevitable comes to pass. A great drone—one of the roistering crowd that fills the bee-garden with its hoarse noontide music—spies her, and gives instant chase. At sight of him she wheels, and darts away into the sunshine at lightning speed. Yet the first drone has hardly stretched a wing before another is after him, and still another. Thick and fast from all points they gather for the race, until the fleeing queen has drawn a whole bevy of them, streaming like a little gray cloud behind her. This much you can see as you strain your eyes in their track; but in a moment quarry and huntsmen have vanished together, volleying, as it seemed, straight up into the farthest-most skies.

From her birth to the day that that terrible, living cordon closes about her, almost the whole life of the queen-bee can be followed step by step. Only this one moment of her bridal stands unrevealed, and perhaps forever unrevealable, to human eyes. You can picture to yourself the wild chevy-chase through the clear June air and sunshine; you can give, in fancy, the prize to the strongest and the fleetest; but all you will know for certain is that in a little while the queen returns to the hive, sobered and solitary. She has been the bride of a moment; now she is to be the widow of a lifetime.

Henceforward her days are to be spent in the twilight

cloisters of the hive, flying abroad so rarely that many an old experienced beeman will say she comes forth only once a year, when she leads a swarm. Before her marriage flight she was the least considered of all the colony; now she is welcomed home with public ovation; lauded, fed, and fondled; set up in the high place, a living symbol of the tens of thousands unborn. As in olden, savage times, the royal festivals had their human sacrifices, so this paramount day in the perfected communism of the bee-people must vent its rejoicing in slaughter. But it is not tribute of common slaves that is now to redden the State-shambles, nor will the work fall to the common executioner's knife. There are captive queens in the citadel—a royal sacrifice ready to hand, and a royal blade hungering for the task. Once the queen has proved her intrinsic motherhood, and the first few worker-eggs have been laid in the comb, the guards will stand away from the royal prison-cells and let her wreak her will upon them. It is all very ghastly in a miniature way, yet very queenly, as old traditions of human queenhood go. She gives over her nursery work gladly enough for a moment, and flies to the slaughter, tearing down the prison-doors, and putting each clamorous captive fiercely to the sword.

The old story—which has held such a long and honored position in school text-books, and in the writings of those who tell of Nature's wonders from the commanding watch-tower of the study fire—the old story of the queen-bee ruling her thirty or forty thousand dutiful subjects, and guiding them unerringly in all their marvelous exploits and enterprises, must go now with the rest. For the truth, as modern observers have unquestionably established it, is that the queen-bee is no ruler in the hive, but even a more obedient subject than any. The real instigators and contrivers of everything that takes place within the hive are the worker-bees themselves. The queen has neither part nor lot in the direction of the common polity; nor has she any power, mental or physical, to help in the carrying out of public works. Her sole duty is that of motherhood, and even in this she derives all initiative from the sovereign worker-bees. She is little

more than an ingenious piece of mechanism, and carefully guarded and cherished accordingly. But as an intelligent, originating force, she counts for nothing. The mind in the hive is the collective mind of the whole colony, apart from the queen and drones—an hereditary, communal intellect evolved through the ages, the sum and total of all bee experience since the world of bees began.

If, however, modern science compels us to divest the mother-bee of her regal state and quality, and thus destroy one of the prettiest delusions of ancient times, it is only to take up a story of real life more alluring and romantic still. In the light of new understanding the old facts take on a mystery and excite a wonderment greater than ever before. If we found the life of the bee an enthralling study when we supposed it to originate from one winged atom endowed with acute and commanding abilities, how much more fascinating must it prove when we come to see that all this complex system of government is instituted and kept together by the harmonious working of tens of thousands of reasoning beings?

The story of the Comb-Builders is so wonderful, that exuberance of language is as powerless to exaggerate as a niggardly tongue to minimize, its true and due effect.

To understand all that the bees have accomplished when a new, empty hive has been filled throughout with waxen comb, it is necessary to follow the operations of the swarm pretty closely during the first few weeks of its separate life. It is a big undertaking, the building of an entire, new bee-city, and the problems that confront the builders are many and complicated. In the first place, whether she ever attains it or not, the worker-bee will aim at nothing short of perfection. Hereditary experience tells her exactly what are the home requirements of the colony, and she now gets to work to fulfill them in the best imaginable way.

A city is to be built which is to accommodate twenty or thirty thousand individuals. Vast nursery quarters must be constructed, as there may be as many as ten or twelve thousand youngsters to cradle at one and the same time. For at least six months of the year no food will be obtainable from

outside, so that the city must contain large storehouses capable of holding more than a six months' supply. As the temperature in winter can be kept up only by the bodily warmth of the inhabitants, life in the city must be concentrated into the smallest possible space; and the materials of which the city is built must be heat-conserving, while its construction must allow of perfect ventilation at all times, and in summer it must permit a free circulation of air, that the surplus heat can be readily carried off. The city must be a fortress as well as a home, and be closed in on every side as a protection against its many enemies, as well as the weather.

There is another, and just as vital, a condition governing its construction—the necessity for strict economy in material. If there were any natural substance having the qualities of tenacity, lightness, ductility, and strength which the bees could obtain out of doors instead of wax, no doubt they would use it for comb-building, and they would not spend hours of precious time and consume large quantities of hard-won stores in the manufacture of their own material. But it seems there is nothing in nature possessing the needful properties. Bees collect a resinous substance, notably from the buds of the poplar, which they use for stopping up crevices. They dilute this also into a varnish, with which they paint the finished combs, and sometimes even combine it with wax to form a rough filling, but it appears to be useless in cell-construction. The whole city must needs be made of wax, and wax alone; and the bees are as careful of this precious substance as a miser of his gold.

The story is an old and famous one, but it will bear repeating. A great naturalist once put himself to an infinity of trouble in measuring the angles formed by the rhombs in a vast number of comb-cell bases, and he found that these showed remarkable uniformity. It will be clear that the hollow pyramid of the cell-bottom will be either deep or shallow, according to the shape of the three rhombs composing it. The apex of the pyramid is formed by the meeting of three equal angles, one from each rhomb; and it is plain that this apex will be sharp or blunt, according to whether the meeting

angles are wide or narrow. It was, of course, impossible to ascertain the dimensions of these angles with absolutely microscopical nicety; but, dealing only with the most perfect comb, the naturalist found that the two greater angles in the rhombs measured very nearly 110° , and the two lesser angles 70° . He also found that the angles formed by the conjunction of the cell-sides with the bases had the same dimensions as those of the rhombs. Assuming, therefore, that mathematically the angles of the rhombs and cell-sides should be equal, he was able to calculate exactly the angles for which the bees were evidently striving in the construction of the rhombs— $109^\circ 28'$ and $70^\circ 32'$.

Another bee-lover scientist, ruminating over these figures, was much impressed by them, and determined to find out why the bee made such constant choice of this particular shape of rhomb. He therefore conceived the idea of submitting the bees' judgment on this cell-base question to an independent authority. Without disclosing his object, he propounded the following problem to one of the greatest mathematicians of the day:

"Supposing," said he, in effect, "you were required to close the end of an hexagonal vessel by three rhombs or diamond-shaped plates, what angles must be given to these rhombs so that the greatest amount of space would be enclosed by the least amount of material?"

It was a difficult problem, but the mathematician worked it out at last, and his answer was " $109^\circ 26'$ and $70^\circ 34'$!"

Now, the difference between the calculation of the man and the calculation of the bee was an exceedingly small one. No one thought of calling into question the work of the man, who was preëminent in his world of figures. It was therefore accepted as a fact that the bee had made a trifling mistake—so trifling, however, that, in the matter of comb-building, it was of no importance. Her reputation was unimpaired; to all intents and purposes the honey-cell was still a perfect example of utmost capacity secured by least material.

But another mathematician—a Scotsman this time—went over the whole business again, and he proved conclusively

that the bee was right, while the first mathematician was wrong. He showed that the true answer to the problem of the angles was $109^{\circ} 28'$ and $70^{\circ} 32'$ —identically the figures obtained by estimation of the honey-comb!

The bees begin a comb by attaching a small block of wax to the roof of the hive. On either side of this they hollow out depressions, which become the bases of the first cells. The work is then extended downwards and wideways, the cell-bases being multiplied in all directions as fast as possible, so that there are a great number of unfinished cells in progress long before the walls of the first cells have been completed. There is a very reasonable motive for this procedure. When a house is being built, as much of the foundation as possible is laid in at the commencement, to allow a large body of bricklayers to get to work on the walls at the same time; and the bee extends her comb foundations on the same principle.

If the bees made a vast number of separate, round cells, and then combined them simultaneously, no doubt all but the outside cells would assume the hexagon form. But the essence of the whole art and ingenuity of comb-building lies in the fact that there is no such thing as a separate cell. Each single compartment in the comb shares its parts with no less than nine other compartments. And to talk of mutual interference when there is no separate existence is plowing the sands indeed.

There are other circumstances connected with the work of the comb-builders which go far to confirm the position that bees do exercise reason, and that of a high order. It has been said that the interior of a hive in daytime is not altogether deprived of light. Probably, during the hours of greatest activity, the bees have always enough light to see their way about by means of their wonderful indoor-eyes, which, under the microscope, have all the solemn wisdom of an owl's. It is a fact, however, that comb-building is usually carried on at night-time, when other employments are in temporary abeyance. Possibly the—to our eyes—profoundest darkness may be no darkness at all to the bees; but, to all appearances, as

we can judge of them, honey-comb is virtually made in the dark.

But combs are built side by side, often simultaneously. They grow downwards together, yet always preserve their right distance apart; so that, when finished, there will be an intervening gangway between the sealed surfaces of about a quarter of an inch, which is just enough to allow the two streams of bees to pass each other, back to back.

At the most, a worker-bee sees but six months of life; at the least—and this is the lot of many—she withstands the incessant wear and tear of her hard calling for six, or possibly eight, weeks. Thus, though the hive may be always packed with citizens, the population is forever changing. Half a dozen times in the year, perhaps, and for a score of years, you may go to your bee-garden, and each time move among tens of thousands to whom you are an utter stranger, and whom you have never seen before. And yet, in all its customs, its propensities, its traditions, the life of the bees is Continuity personified. You may go round the world, and spend ten years on the journey, and, coming back to the old leafy nook of the country, find the old green hive still in its corner under the lilac, still the center of what seems the same crowd of winged merchant-women sailing home under the same gay colors, singing the old glad songs, building the old wondrous fabrics in the darkness, transmuting the same fragrant essences into the same elixir of gold.

THE ANTS

From THE CORNELL RURAL SCHOOL LEAFLET

AS some things are judged by their economic value, it is probable that Solomon discovered the greatest practical value of the ant when he advised the sluggard to go and study her ways. It is safe to say, however, that no sluggard ever took this advice, for to follow the ant in her devious ways would be too hard work for the idler. As a matter

of fact, the economic status of the ant has not yet been determined, and very likely her relationship with other insects will be our final basis for judging whether her performances are useful or detrimental.

For a hundred years we have known that ants used aphids, or plant lice, to obtain food, but only recently have we discovered that this practice of the ants is of economic importance. The aphids live on the juices of plants by inserting their long, sucking tubes into the plant tissues and taking their nourishment as a boy takes a soda through a straw. Incidentally, they transform much of the sap into honeydew, which they excrete in drops from the alimentary canal. The ants are very fond of this honeydew and will climb trees and shrubs in order to visit the aphids and thus obtain the sweet food. When an ant wishes honeydew she approaches an aphid and strokes or pats it gently with her antennæ; and if the aphid has not been milked dry by other ants, she will promptly produce the coveted substance. Since the ants are such clever creatures, they naturally would defend their aphid herds from any attacking insects, and such defense has been often observed; but we are beginning to believe that there are still more fundamental relations between ants and aphids.

Professor Forbes, in studying the corn root-louse, discovered that the ants care for the eggs of this aphid in their own nests during the winter and take the young aphids out early in the spring, placing them on the roots of smartweed; later, after the corn is planted, the ants move the aphids to the roots of the corn, and thus they preserve this terrible pest, which without their aid would be unable to live and flourish. One species of aphids living on dogwood is protected by stables which a certain species of ant builds around them from mortar made of earth and vegetable matter. Some species of ants are mushroom-growers. Many are the wonderful things which these little insects accomplish.

Many of our common ants live in ant hills or build their tunnels in the earth; in the latter case, they usually have the openings of their tunnels beneath stones in fields. At the gateway in any ants' nest there are likely to be sentinels sta-

tioned, to give warning of intruders. When a nest is disturbed the ants run in every direction to get out of the way. If, however, there are in the nest any of their young, in either the larva or the pupa stage, the ants are never too frightened to take them up and try to carry them to places of safety.

Ants' eggs are very small objects, each about the size of the point of a pin. The larvæ that hatch from these eggs are translucent little grubs, looking like grains of rice but more pointed at one end. The pupæ are yellowish, are covered with a parchment-like skin, and resemble grains of wheat. They are commonly called ants' eggs. When the pupa skin breaks, the full-grown ant appears, and at first is pale in color.

Often there are in the same colony ants of two sizes: the large ones are called majors and the small ones minors. Whatever their size, however, they all work together to bring food for the young and to care for the nest.

During most of the year the ant colony consists only of workers and laying queens, but in early summer the nest may be found swarming with winged ants. These are kings and queens. Some warm day these winged ants will issue from the nest and take their marriage flight, the only time in their lives when they use their wings. After the marriage flight, the ants fall to the ground. In this way undoubtedly a large number perish. In most species, we know that the queens find refuge in some shelter and there lay their eggs. Perhaps many of them are adopted into other colonies of the same species. The queen sheds her wings after the marriage flight.

In an ants' nest there may be more than one queen, for ants differ from honeybees in this respect. Each queen has her own apartment, and is well cared for by her ladies-in-waiting. They feed her and groom her, so that she is able to give her whole time and energies to producing eggs. As soon as she lays an egg, it is taken by some of the nurse ants and carried to a nursery, which contains other eggs of about the same age. Whether the nurses by their care are able to retard or hasten the hatching of the eggs we do not know. We do know that in many of the ants' nests the nurseries remind us

of a graded school, because a large number of just about the same age are to be found in the same nursery; and it is undoubtedly a fact that the ant nurses, by feeding some more than others, are able to keep the whole brood in about the same stage of development. When the larvæ are young they are fed on regurgitated food, but as they grow older the food is brought to them or they to the food, and they do their own feeding. In one nest was placed a part of the yolk of an egg, hard-boiled, and the ant nurses dumped the larvæ down around the edges of it; and there they munched industriously until through their transparent bodies could be seen the yellow of the egg for the whole length of the alimentary canal.

The ant nurses are very particular about the temperature of the nurseries, and are even more careful lest the young suffer from drafts. Thus they are obliged to move them about in the underground nests, carrying them down to the lower nurseries in the heat of the day and bringing them up nearer to the warmer surface during the evening. This moving is always done carefully; and, while an ant's jaws are formidable weapons, she carries her baby sisters with gentleness. The ant nurses keep the larvæ and the pupæ very clean by licking them. When a youngster issues from the pupa skin, the nurses hasten to help her straighten out her cramped legs and antennæ, feed her assiduously, and help her make her first toilet.

Ants are very cleanly in their nests, and will carry out of it any débris or foreign substance. Although their chief work is the building of their underground galleries, the care of the young, and the bringing of food to the nests, yet they are also efficient fighters. There are many stories of ant battles which have been waged furiously from dawn until evening, and continued with unabated fury for successive days. We do not know all the reasons for wars among ants, but in some observed instances they have been caused by one colony trespassing on the territory of another. In other cases, war has followed an attempt on the part of one species to capture the young of another species in order to rear them as slaves in their own nests. Slavery among ants has its mitigations,

for the slaves are treated like the other members of the family, except that their duties are of the domestic sort and they are not allowed to go to war. The ants never seek to enslave a full-grown ant, but capture only the larvæ and the pupæ, which they rear in their own nests.

If you take one ant and study her appearance, you will find that her body is divided into three parts: the head, which bears the not very distinct eyes; the antennæ, which are the ant's chief means of acquiring knowledge of the world around her; and the jaws, which are large and work sidewise, like a pair of shears, and are armed with triangular notches along the biting edge. Miss Fielde has shown us that the different segments in the antennæ of an ant are used for detecting different things. For instance, the tip segment detects the odor of an ant's own nest, and enables her to distinguish this from other nests; through the next segment she is able to recognize her sisters wherever she finds them; and through the third segment she recognizes the odor of her own feet and thus is able to retrace her own steps.

The thorax bears the three pairs of legs, and, in the case of queens and kings, two pairs of wings. The ant's legs are very efficient; she is an excellent runner, and she can take astonishing leaps when pursued.

The abdomen is attached to the thorax by a very narrow connection, so that most ants are slim-waisted. The abdomen consists of several segments and has breathing pores along the sides, which are difficult to detect.

THE SPIDERS

By MARGARET WENTWORTH LEIGHTON

MAN is not as skilful as a spider, and doubtless never will be, for to-day a spider's thread is used in the telescope because man has been unable to manufacture one so fine and delicate.

Whenever I look at the marvelous web of the great black-

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and-gold garden spider I remember that pretty story of the way in which the group of spiders received its name of *Arachnida*. In the olden times there was a lovely maiden named Arachne, who could weave and embroider with such deftness that the nymphs all gathered to watch her. They whispered to each other that she must have been taught by Minerva herself, who was the goddess of Wisdom. Arachne overheard them, and, denying their accusation, challenged Minerva to a trial of skill. Minerva accepted the challenge, and when the webs were woven Arachne's was wonderfully beautiful, but Minerva's far surpassed it. Arachne was in despair and hung herself, whereupon Minerva's chagrin was so great that she transformed her into a spider, and her descendants preserve much of her skill.

We are apt to think of spiders as insects, but really they are only distantly related to insects, their first cousins being scorpions and king crabs. The spider's body consists of two parts. It has four pairs of legs, a pair of palpi, and a pair of mandibles. The legs are jointed, and on the last joint there are three claws. The palpi are used as feelers and to hold the food. The breathing apparatus of the spider is a combination of lungs and gills. It has glands containing poison which lie partly in the head and partly in the basal joint of the mandibles. There is a tiny opening in the claw on the mandible, out of which the poison flows when the spider captures its prey. It has eight eyes. The spiders are classified largely by the different arrangements and grouping of the eyes. Some have them in one or more clusters, some in rows, and others scattered about. They appear to be able to see as well by night as by day. Near the end of the body are the spinnerets—two, three, or four pairs—out of which the silk comes for weaving the webs, nests, and egg cocoons.

Usually the female spider is much larger and stronger than the male. One naturalist thus graphically describes their wedded life: "Their honeymoon is of short duration, and is terminated by the bride's banqueting on the bridegroom. Doubtless she evinces taste and discrimination in her appreciation of a 'nice young man.'"

Spiders, like lobsters and other crustaceans, have the power of reproducing certain parts if they happen to meet with an injury, as legs, palpi, and spinnerets.

We find as marked differences in habits, tastes, and characters among spiders as among human beings. Some kinds prefer always living in houses or cellars, not seeming to care for any fresh air or out-of-door exercise. Mr. Jesse tells of two spiders that lived for thirteen years in opposite corners of a drawer which was used for soap and candles. Others delight in making burrows in the earth, in dwelling under stones or behind the loose bark on trees, and others live under water. Many never leave their webs, but patiently wait, hoping some insect will become entangled in the snares they have set. Others dash about and seize upon every luckless insect that crosses their path. The most adventurous of all are those that sail out into the world on one of their own little threads. Darwin tells of encountering thousands of them many leagues from land when he was taking his famous voyage in the "Beagle." He says: "The little aeronaut, as soon as it arrived on board, was very active, running about, sometimes letting itself fall, then reascending the same thread. It could run with facility on the surface of the water."

In the bright autumn weather, if we observe closely, we may sometimes see some of our own small spiders ascend to the tops of trees, fences, and other high objects, rise on their toes, turn the spinners upward, throw out a quantity of silk, and sail away. They can be seen plentifully any fine day in October or November, before the cold weather, on Boston Common. They grasp the silken thread with their feet and seem to be enjoying themselves as much as the butterflies.

Many instances are recorded of music-loving spiders, perhaps the most interesting being that related by Beethoven's biographer, who says: "A spider weaving its skilful, though delicate, trap for its daily dinner worked industriously in the corner of the ceiling until Beethoven began to play. Beethoven, who at that time had not thousands hanging on his baton, was rather pleased and attached to this listener, which most practically proved the value it attached to the performance by

risking its life in coming nearer the enchanted instrument. And ill was it rewarded. The mother one day, perceiving the ugly animal, seized and killed it. But the boy Beethoven was so put out and so miserable at losing his strange auditor that he burst into tears and, seizing his violin, smashed it against the floor, shivering it into a thousand pieces."

Many kinds build their webs and cocoons in exposed places and take no pains to conceal them, while others cover theirs with tiny pebbles and bits of earth for protection. Some kinds of spiders abandon their egg cocoon as soon as it is finished, while others carry it about with them until the babies appear. One mother allowed herself to be torn to pieces rather than leave her cocoon.

We might compare the spider's different modes of getting about to those of the birds. The hunting spiders leap and hop, the house spiders generally run forward, other kinds run backward and sideways with equal facility, and some, as we have seen, float about in the air. The most marvelous of the spiders' gifts is the silk-spinning. The spinnerets or spinners are little organs at the hind end of the body. Each has a number of very minute holes in it. Out of these the silk flows in a liquid form, but as soon as the air strikes it it hardens into a thread. The strands from the different holes all unite and form what we know as the spider's thread.

There are great differences in the kinds of webs and nests which different spiders make. One of the most interesting is the web of the great black-and-gold garden spider. First she spins several lines all joined in the center like the spokes of a wheel, and attached to stems or leaves of plants at the outer edges. When the rays are finished she begins at the middle to make the spiral part. It is fascinating to watch her, as she crosses each spoke, stop and pat down the silk once or twice, then pull it to see if it is well secured before passing to the next one. When the web is finished, she makes a zigzag ladder of white silk, running from the bottom outer edge to the center. When she hangs in the middle of her web, as she does much of the time, the ladder helps to conceal her. The web is made of two kinds of silk—one smooth, the other

covered with an adhesive liquid. When the insects are caught, their legs and wings are soon covered with the sticky juice, so that it is impossible for them to escape. The spider, knowing it would not be convenient to become entangled herself, spins one long, smooth thread from the center to the outside, which she uses in traveling to and fro.

The common house spider is wonderfully sagacious. Once in a while a large insect is caught in her web. She wants to take it up to her inner retreat to devour, and it is too heavy for her to carry. What is she to do? First she bites its leg, injecting some of her poison, which stupefies it. Next she throws some additional threads about it and ascends to the top, pulling the thread as hard as she can. When she has rested for a little time, she winds more threads about her victim and pulls again, each time attaching the threads at the top. In this way she finally succeeds in hoisting her feast into her house, though the process may last several days.

Who would think that our predecessors in the art of curling the hair were spiders? One species has been provided by Nature with a sort of little curling comb called the *calimistra*. It is on the hind legs and consists of two rows of parallel spines. The web, which she makes of bluish-white silk, is unusually pretty, as each thread is gracefully curled by drawing it between the spines.

Thoreau calls the little gossamer webs which we see spread over the grass on a dewy morning the napkins of the fairies. Even Chaucer, who wrote over five hundred years ago, mentions them as a great curiosity to the people of his time. He says:

As sore wondren som on cause of thonder,
On ebb and flood, on gossamer and on mist,
And on all thing, 'til that the cause is wist.

A hundred and fifty years ago a Frenchman, M. Le Bon, made some stockings, purses, and gloves from spiders' silk. The Bermuda ladies use the thread of *Nephila* for sewing, and Queen Victoria was presented by the Empress of Brazil with a dress made of spiders' silk.

Spiders molt several times, each time appearing in a differ-

ent color. We should hardly expect to find very brilliant or showy colors among them, yet some of them are gorgeous in the extreme. A little crab spider that built a house in my garden was the brightest lemon-yellow all over, and shone like a jewel amid the dark green of the surrounding foliage.

Two of the spiders' worst enemies are mud wasps and ichneumon flies. In searching recently for spiders beneath the clapboards on the south side of the house, I came across one of those curious structures which the mud wasp builds. I broke it open, and out tumbled a quantity of small spiders. The wasp's storehouse was in three compartments, and all together contained forty-nine spiders, all of the same kind and about the same size, in a torpid condition. The wasp had laid an egg in each of these spiders. She does not kill the spider, but merely stupefies it, so that when her egg hatches the larva may feed upon the luckless spider.

If one be a student of Nature he will perhaps have noticed a spider rush away and hide in her crack without any apparent reason. The moment before she had been enjoying the bright sunshine, and the student wonders why she ran away. The spider's perceptions are so keen that she knows long before he does that the sky will soon be overcast and torrents of rain descend or a cold wind begin to blow. If she stayed out she might soon be benumbed and unable to run into her house.

The water spiders are covered with hairs which shed the water, so that they never get wet. The little house under the water in which they live and raise their families is as snug and dry inside as yours and mine.

No spiders are more interesting than the trapdoor spiders and their first cousins the tarantulas. The former live in Europe and California. First they make a burrow in the ground and then build the door. The California ones make their door of mud and sticks. It fits into the tube as a cork does into a bottle. The covers built by the European species are mere little lids, but they are always built so as to resemble the surrounding surface. One kind shows her sagacity by building a sort of double door, by which she can escape should

an enemy storm her fort. At the surface is the usual door, and a few inches below this another. When the spider hears an enemy investigating her burrow, she runs below the second door and pushes it up, so that the marauder will think he has happened upon an empty nest, the second door forming the bottom of it. The babies are born in the tubes, and remain with their mother until they are able to make nests for themselves.

These spiders spend the days in their burrows, but at night they all flock out to enjoy themselves. They fasten open their doors and make little webs over the grass. Many night wandering beetles are caught, and then comes the banquet, which consists of the softer parts of the beetles. In the morning the closest observer could not find a trace of the preceding night's revelry, so carefully have the spiders cleared away all webs, beetle legs, and wing covers.

One group of spiders is called *Lycosa*, which means wolf spider. Perhaps they were named from the similarity of their habits to those of the wolf, being like him wandering and predaceous.

One of these is the tarantula, a great hairy fellow who inhabits warm countries. The species received its name from the Italian city of Tarentum, where they have been found in large numbers. There is a curious superstition connected with the tarantula's bite. If a person was bitten it was thought nothing could save his life but the playing of some lively dancing tunes. When he heard these he was supposed to be unable to resist the temptation to dance. Thus he grew very warm, and the perspiration came out in great beads all over him, each bead filled with poison. After he had danced as long as he possibly could, the poison had all escaped from his system. The tarantulas feed on small birds as well as insects. Indeed, one of the great southern species is called the bird-catching spider.

In India, where all animals are treated with consideration and even reverence, the little children often keep these spiders for pets. They tie a cord round a spider and lead it about, feeding it with worms and insects. Mother *Lycosa* always

carries her egg cocoons out with her on her hunting expeditions, attached to the spinnerets.

One summer I kept a garden spider for three weeks under a tumbler, and had the pleasure of watching her building her house of snowy silk, with its three entrances, and raising a large family of children. She soon learned to take flies from my hand and drink water from a leaf which I gave her fresh every day. After a time she seemed to languish and droop, so I set her free in the garden once more.

If you wish to live and thrive,
Let a spider run alive

says the old Kentish proverb.

THE BLACK CRICKETS

From THE CORNELL RURAL SCHOOL LEAFLET

THE haunts of the cricket are usually sunny; it digs a little cave beneath a stone or a clod in some field, where it can have the whole benefit of all the sunshine when it issues from its door. The black cricket cannot fly, since it has no wings under its wing covers as have the grasshoppers. The hind legs have a strong femur, and a short but strong tibia with downward-slanting spines along the hind edge, which undoubtedly help the insect in scrambling through the grass. At the end of the tibia, next to the foot, is a rosette of five spines, the two longer ones slanting to meet the foot; these spines give the insect a firm hold when making ready for its spring. When walking, the cricket places the whole hind foot flat on the ground, but rests only on the claw and the segment next to it of the front pairs of feet. The claws have no pads like those of the katydid or the grasshopper; the segment of the tarsus next the claw has long spines on the hind feet and shorter spines on the middle and front feet, thus showing that the feet are not made for climbing but for

scrambling along the ground. When getting ready to jump, the cricket crouches so that the tibia and the femur of the hind legs are shut together and almost on the ground. The dynamics of the cricket's leap are well worth studying.

The patent-leather finish to the cricket's clothes is of great use; for, although the cricket is an efficient jumper, it is, after all, mostly by running between grass blades that it escapes its enemies. If we try to catch one, we realize how slippery it is and how efficiently it is able to slide through the fingers.

The cricket's features are not very easily made out, because the head is polished and black; the eyes are not so polished as the head, and the simple eyes are present but are discerned with difficulty. The antennæ are longer than the body and are very active; there is a globular segment where they join the face. The lens reveals to us that the flexibility of the antennæ is due to the fact that they are many-jointed. The palpi are easily seen, a large pair above and a smaller pair beneath the "chin." The palpi are used for testing food and in order to prove whether it be palatable. The crickets are fond of melons and other sweet, juicy fruits, and by putting such food into the cage we can see the insects bite out pieces with their sidewise-working jaws, chewing the toothsome morsels with gusto. They take hold of the substance they are eating with the front feet, as if to make sure of it.

The wing covers of the cricket are bent down at the sides at right angles, like a box cover. The wing covers are much shorter than the abdomen, and beneath them are vestiges of wings, which are never used. The male has larger wing covers than the female, and they are veined in a peculiar scroll pattern. This veining seems to be a framework for the purpose of making a sounding-board of the wing membrane, by stretching it out as a drumhead is stretched. Near the base of the wing cover there is a heavy crossvein covered with transverse ridges, which is called the file; on the inner edge of the same wing, near the base, is a hardened part called the scraper. When he makes his cry, the cricket lifts his wing covers at an angle of forty-five degrees and draws the scraper

of the under wing against the file of the overlapping one; lest his musical apparatus become worn out he can change by putting the other wing cover above. The wing covers are excellent sounding-boards and they quiver as the note is made, setting the air in vibration and sending the sound a long distance. The wing covers of the female cricket are more normal in venation. The female may always be distinguished from her spouse by the long, sword-like ovipositor at the end of her body; this she thrusts into the ground when she lays her eggs, thus placing them where they will remain safely protected during the winter. Both sexes have a pair of "tail feathers," as the children call them, which are known as the cerci (singular, *cerca*) and are fleshy prongs at the end of the abdomen.

There would be no use of the cricket's playing his mandolin if there were not an appreciative ear to listen to his music. This ear is placed most conveniently in the tibia of the front leg, so that the crickets literally hear with their elbows, as do the katydids and the meadow grasshoppers. The ear is easily seen with the naked eye as a little, white, disk-like spot.

The chirp of the cricket is, in literature, usually associated with the coming of autumn; but the careful listener may hear it in early summer, although the song is not then so insistent as later in the season. He usually commences singing in the afternoon and keeps it up periodically all night. I have always been an admirer of the manly, dignified methods of this little "minnesinger," who does not wander abroad to seek his lady love but stands sturdily at his own gate, playing his mandolin the best he is able; he has faith that his sable sweetheart is not far away, and that if she likes his song she will come to him of her own free will. The cricket is ever a lover of warmth and his mandolin gets out of tune soon after the evenings become frosty. He is a jealous musician. When he hears the note of a rival, he at once bristles up, lifting his wings at a higher angle and giving off a sharp militant note. If the two rivals come in sight of each other, there is a fierce duel. They rush at each other with wide open jaws, and fight until one is conquered and retreats, often minus an antenna, a *cerca*, or even a leg.

THE GRASSHOPPERS

From THE CORNELL RURAL SCHOOL LEAFLET

IT is best to place a grasshopper in a tumbler on a spray of fresh herbage, and observe it at leisure.

The grasshopper earns its name by its powerful jumping, and it performs its jump after the most approved athletic methods. The long hind legs are folded together parallel with the insect's body, and the entire foot, with a spine in the heel, is pressed to the ground. Then, like a steel spring, the long legs straighten and the insect makes a jump that, translated into human terms, would be equal to a man making a standing jump of five hundred feet. Of course this is an excellent method on the part of this insect to escape its enemies, such as birds, skunks, and other animals.

The grasshopper's face has a most comical expression. It is a long face, with the compound eyes placed high on it; and in front of each big eye, and between and below them, are the three tiny simple eyes. The antennæ are short, but alert. There are two pairs of jaws which move sidewise, and connected with these are the palpi, or feelers, which continually tap the food while the insect is eating.

Back of the head is a sunbonnet-shaped piece, bent down at the sides, which forms a cover for the middle part of the body, called the thorax. To the thorax are attached the three pairs of legs, the wings, and the wing covers. The wing covers are not meant for flying, but are held stiff and straight up in the air during flight. The true wings when at rest are folded lengthwise, like a fan, beneath the wing covers. They are strongly veined and circular, and are capable of either short, swift flights, or long-continued flights when the insects occur in hordes and migrate into new territory.

The abdomen consists of rings, as in all insects, and along

the lower sides there are two lengthwise creases which open and shut when the grasshopper breathes. The spiracles, or breathing pores, can be seen on each segment, just above this suture. The ears are two large disks, one on each side of the first segment of the abdomen, and can be seen by lifting the wings. The long-horned grasshoppers have their ears in the front elbow, like the katydid.

Grasshoppers lay their eggs in oval masses protected by a tough covering. They are placed in the ground or in decaying wood in the fall. They hatch early in the spring, and the young are therefore ready to attack the tender crops.

LIST OF BEST BOOKS ON THE ANIMAL WORLD

ABBOTT, C. C.*	<i>Days out of Doors</i>
BAILEY, FLORENCE M.*	<i>Birds of Western U. S.</i>
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* In many cases the authors mentioned have written other books equally interesting and procurable.

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